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JANUARY 18, 1936

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# ELECTRICAL WORLD

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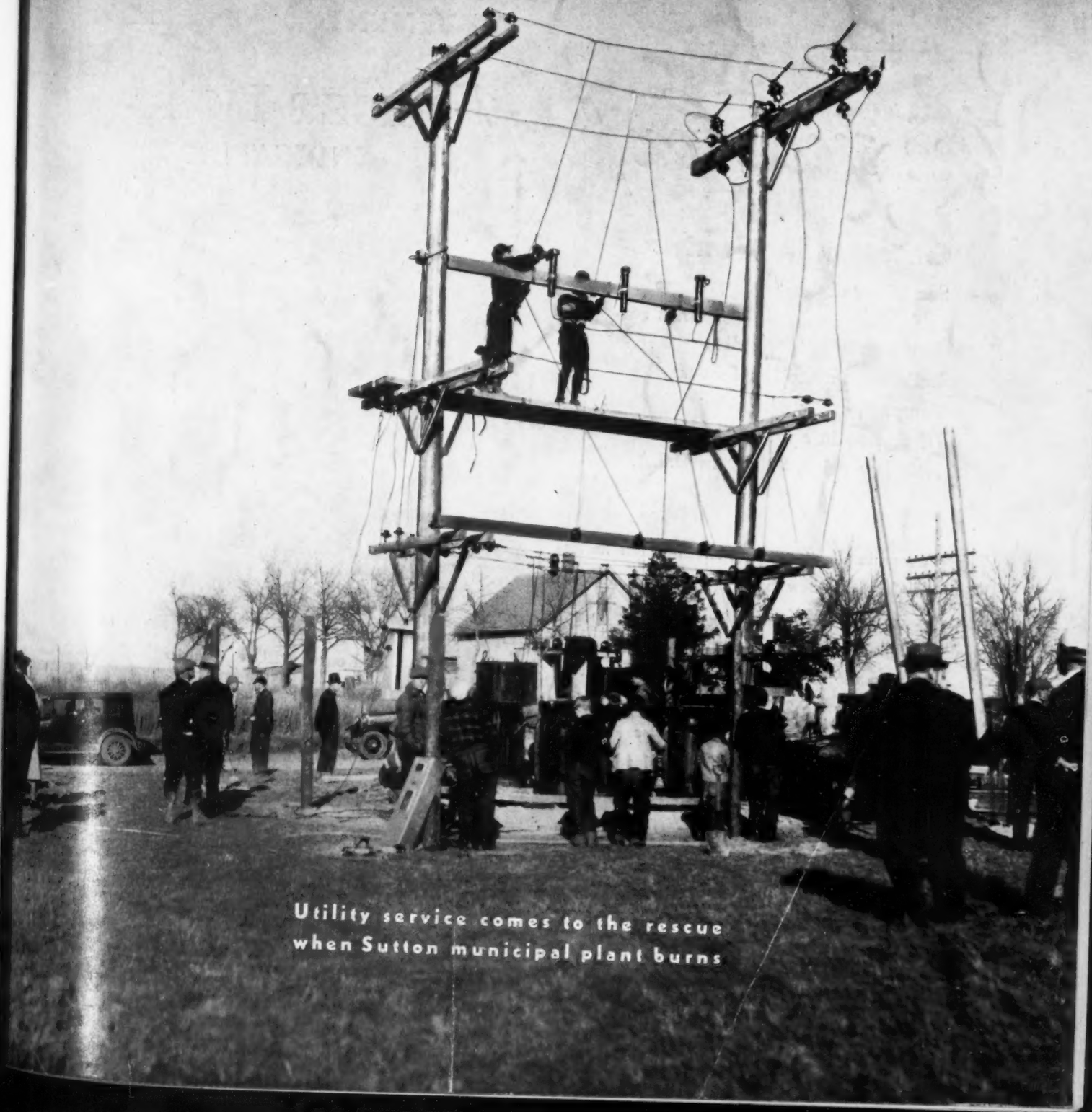

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# ELECTRICAL WORLD

FOUNDED IN 1874 ✦ ✦ READ BY ELECTRICAL MEN FOR SIXTY YEARS



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## Reader's Guide to This Issue

Technology on systems, utility rescue of a crippled municipal, elevation of the small customer, industrial welding practice, better trainshed lighting are main features.

### Of Executive Interest

A municipal plant ruined by fire restores service through interconnection with utility. Alabama Power builds sales program around chest refrigerator. Welding, lighting, distribution items show markets and economies.

### For Power Company Engineers

Brooklyn improves manhole cover designs. Supervisory control facilitates reliability of railroad service. Line and substation quickly built to serve wrecked municipal.

### On Power Company Sales

ELECTRICAL WORLD inaugurates industrial power data sheet series. Resistance welding summarized. Better lighting in Chicago trainshed.

### For Electrical Engineers

Welding in industrial fabrication, supervisory control system detailed for Pennsylvania Railroad. Circuits controlled over primary neutral.

### For Electrical Manufacturers

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### Is A.C. Threatened?

Professor Skilling does not fear that d.c. transmission will make great inroads on well-established and well-adapted a.c. system.


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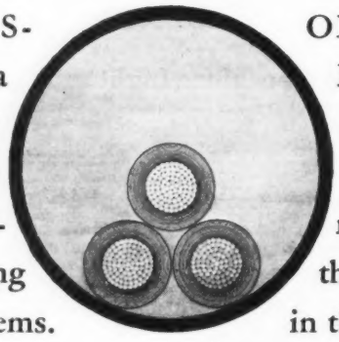

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# LETTERS TO THE EDITOR

## *Unit Plant Reliability*

*To the Editor of* ELECTRICAL WORLD:

We read with considerable interest the article "Additions to Steam Plant Capacity," by F. S. Clark in the November 23 issue of the ELECTRICAL WORLD, and consider it an excellent summary of general engineering development in generating plant design. However, there is one statement in the article that has apparently been featured by your editorial staff without qualification, with which we think experienced operators will take issue, almost without exception. This bare statement without any supporting data is as follows:

"The installation of one steam generating unit per turbine generator is now considered a *reliable* arrangement. . . ."

We should like to know by whom is such an arrangement considered reliable? And, what is their definition of reliability? Does this mean that a boiler unit with accessories is now considered as reliable for continuous service as a turbine? Surely, we have misinterpreted this statement. In case we haven't, we should greatly appreciate reading another article in your magazine in which Mr. Clark, or some design engineer of equal professional standing with Mr. Clark, sets up a hypothetical "unit" boiler plant at some needed location, of capacity with average Middle West water conditions, using medium-grade bituminous coal (such as Oklahoma, Kansas, southern Illinois or western Kentucky coal) for fuel, costing say $0.13 per 1,000,000 B.t.u., giving supporting economy data for omissions and supporting operating data for selection of equipment. To carry out the above statement in fact, this plant must be considered comparable in reliability and over-all (including fixed charge) economy to the equivalent of a one-turbine, two-boiler plant, each boiler having a maximum steaming capacity of about 75 per cent turbine generator rating.

In setting up the conditions, we should not lose sight of the necessity of applying this installation where reliable capacity is actually needed and where certain special local conditions do not invite such an arrangement, as in case of existing plants that have excess boiler capacity already installed.

We do not anticipate acceptance of this suggestion, but in case it should be attempted, we should like to suggest that you publish the article with an insert by the editor inviting operating engineers to criticise it with supporting data in the same manner as would be done in case such a design were submitted to them for a needed addition to their own system. We believe the combined replies properly edited into a single article would not only be very instructive, but would definitely deflate some rather "advanced" ideas concocted on paper by design engineers, in collaboration with manufacturers, which they hope to spring on the harassed operating executives striving to maintain continuous service, as the best answer when it appears that capacity is required, although little money is available for construction.

The "Steam Station Cost Survey" in the same issue of the ELECTRICAL WORLD is the most helpful summary of actual design and operating data we have seen on this subject.

O. HOWARD,
Assistant Superintendent of Generation,
Oklahoma Gas & Electric Co.

Reliability of the unit type station depends upon the design primarily. If the coal to be used is well considered as well as the water the station will be designed to meet the specifications. It all depends.—EDITORS.

•

## *About Lower Cost Wiring*

*To the Editor of* ELECTRICAL WORLD:

I have read with considerable interest the article on "Lower Cost Wiring," which appeared in your publication of September 14, by J. C. Damon, chief engineer of the Public Service Commission of Wisconsin, and with the precocious fearlessness of youth I dare to be bold enough to take issue with so learned an adversary.

I agree with most of what Mr. Damon says about the need for adequate wired homes before the great American market for electrical appliances can be adequately sold; however, that does not mean that mere cheapness of wiring will create those adequately wired homes. Cheap wiring is not the answer, for the very reason which he himself points out, and that is that cheap wiring is already available and has been available for a number of years through chain stores which sell to the mass market. This cheap wiring I refer to is nothing else than extension cords, plugs and sockets which, even though they are unsightly, do offer a simple low-priced expedient for those who have the need for such "adequate" wiring.

I believe this subject is of tremendous importance at the present time and should be given very serious consideration by all the executives of the electrical industry, because if we are to accept with optimism the indications which are now becoming apparent we as a nation are on the verge of an era of greatly accelerated home construction, and I believe that we should now give adequate wiring of the new home market our unbiased attention.

People do not ask for more wiring or more electrical conveniences for the new homes which they build because they do not know enough about either. To get people to want anything we must first tell them about it and how much more desirable it is than other things they have already made up their minds to possess. In new homes house wiring is bought not as a single item but as one item among hundreds, and unfortunately unless sales means are adopted at that time or unless educational effort has been expended previously on the prospect, the wiring cost is included in the general cost of the home, just the same as the fireproof roof, the casement windows or other items of modern home construction.

Lowering the cost of wiring means very little to the "one-time" home builder because he has no yardstick of wiring costs to go by, unlike the woman who buys two linen table cloths at a sale price instead of one, because she knows from previous purchases of linen table cloths that the present opportunity is a real one.

Ice costs about the same today as it did twenty years ago, yet more people use it because the electric refrigeration industry has educated the people on the convenience and economy of food preservation. Cheapness does not create a demand for any unwanted article; that is why specialties are usually sold at a relatively high price to pay promotional costs and are later reduced in price as a greater demand is created for the product, justifying mass production and lower costs. But this is not the status adequate wiring is in at the present time. It is still in its pioneering stage and requires the educational and sales effort usually devoted to a specialty.

According to the Bureau of Commerce in Washington the normal home construction in an area in any one year should equal 3 per cent of the homes standing in that particular area. The total home construction in the last five years has hardly equaled this 3 per cent figure. That means that in the near future there will be a large shortage of homes if conditions approach normalcy. It is therefore my strong recommendation that we as an industry develop a national program combined with active local sales sponsorship to create a demand for adequate wiring in all new homes. Not only will this have a very beneficial effect in bringing about a high standard of wiring adequacy in those new homes, but it will create a demand on the part of residents of old homes for greater adequacy than they now enjoy.

In closing, let me take exception to Mr. Damon's statement "That less than one in a hundred homes are adequately wired." In this area, in which I have the privilege to live, we have conducted an aggressive Red Seal operation for the last five years. In that time about 2,500 homes have been built, of which I would say 90 per cent contain a very high standard of adequate wiring, although just about 40 per cent of them actually pass the Red Seal standard. This 40 per cent contained wiring for an electric range which is a requirement of a Red Seal specification, and which in most cases accounted for Red Seal refusal in the remainder.

SAMUEL S. VINEBERG,
Manager Electrical League
of the Niagara Frontier.

Wiring and wiring costs are relatively unimportant in contrast to the necessity to get people to use adequate wiring. The points raised by Mr. Vineberg are now receiving consideration by the industry.—EDITORS.

THE KERITE INSULATED WIRE & CABLE COMPANY INC

NEW YORK CHICAGO SAN FRANCISCO

ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

*PUBLISHED EVERY SATURDAY*

JANUARY 18, 1936

# *It Happens in Washington, but—*

Congress, the Supreme Court and federal bureaus hold our attention these days because their actions affect the electrical industry.

With bated breath we wait the T.V.A. decision and hope the A.A.A. case foreshadows favorable action. At a minimum, we expect an announcement that forces T.V.A. to sell power only at the dam sites to highest bidders.

So far the government is in an advantageous position in its endeavor to force the selection of the Electric Bond & Share case to test the constitutionality of the public utility act. But the battle is not over. Serious endeavors persist to get completely representative cases before the Supreme Court.

A final report of the Federal Trade Commission investigation of utilities considers the gas industry and recommends forcible divorcement of common ownership of electric and gas utilities. There is a better answer to this problem.

Caution prevails in S.E.C. actions to date. It upheld Mr. Ferguson in his line-cutting episode. It encourages utility financing by operating properties. But a stir was created by its request that a filing be made of the security holdings of utility officers. We hope this commission will continue its slow and constructive actions with respect to the destructive public utility law.

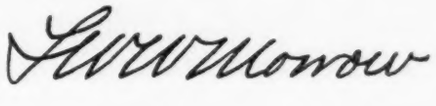
But the boiling pot in Washington is found in the new Congress. Senator Norris has a grandiose bill to spend $100,000,000 a year for ten years to build rural lines—private utilities to be barred. Results of R.E.A. to date should point to the end of this suggestion.

One of the wildest schemes is now before the judiciary committee of the House in the form of a constitutional amendment. It has a complete plank for government ownership of utilities. But higher authorities will not yet dare to propose amending the Constitution—it is not good politics. Senator Hatch believes local citizens should ballot before utility ownership changes can be made. There will be other ideas. But we doubt that Congress will legislate about utilities unless the Supreme Court upsets the present applecart. That is another story.

*But the business of the industry is done outside of Washington.* Reports about business activities and prospects continue to be favorable. All the year-end reviews are encouraging. We look for a steady increase in business for at least the first six months. After that we don't know how a billingsgate political campaign will affect industry.

It is interesting to note that this is an anniversary year for the industry. Westinghouse has had its family party jubilee celebration. The A.I.E.E. is sponsoring a celebration to commemorate fifty years of the alternating-current system. The Aluminum Company will celebrate its jubilee soon. When we look back fifty years we are tempted to paraphrase and say "what hath electricity wrought!"

An event of fundamental significance is the end of the Millikan-Compton controversy over cosmic phenomena. Overwhelming evidence presented at the American Association for the Advancement of Science supports the Compton view of particles instead of the Millikan photons and the breakdown instead of the building-up of matter in inter-stellar space. Practical applications of cosmic bullets have great potential importance.



Editor

*Courtesy Maine State Planning Board*

## POWER FROM MAINE'S TIDES

**Under the Army Engineers Dexter P. Cooper's two-pool Quoddy plan has become a single-pool scheme, thus reverting to the American half of the original $100,000,000 international plan for 1,000,000 hp. Ninety per cent of the time the Quoddy tide lies between 15 and 22.5 ft. Emptying gates will discharge 550,000 cu.ft. per second. Five miles of dam must be built.**

# Pennsylvania Installs Supervisory Controls

## Superlative Reliability of Transportation Demands Centralized Control of Restoration of Supply After Automatic Protective Operations

By E. H. BROWN . . . C. ROMANOVSKY
Pennsylvania Railroad General Electric Company

POWER for operation of the New York to Washington electrified section of the Pennsylvania Railroad is generated at 13.2 kv., 25 cycles and stepped up to 132 kv. transmission potential at the following stations:

At Long Island City and Arsenal Bridge by steam turbo-generators, at Metuchen, Arsenal Bridge, Richmond, Lamokin, Benning and Safe Harbor by 60/25-cycle frequency changer sets. At the latter station also a 25-cycle waterwheel-driven generator feeds into the system.

The transmission voltage is stepped down to 12 kv. trolley potential at various substations located approximately 8 miles apart along the right-of-way.

There are four 132-kv., 25-cycle, single-phase transmission lines installed between New York and Philadelphia and two transmission lines between Philadelphia and Washington, with provision for adding to the latter two lines in the future.

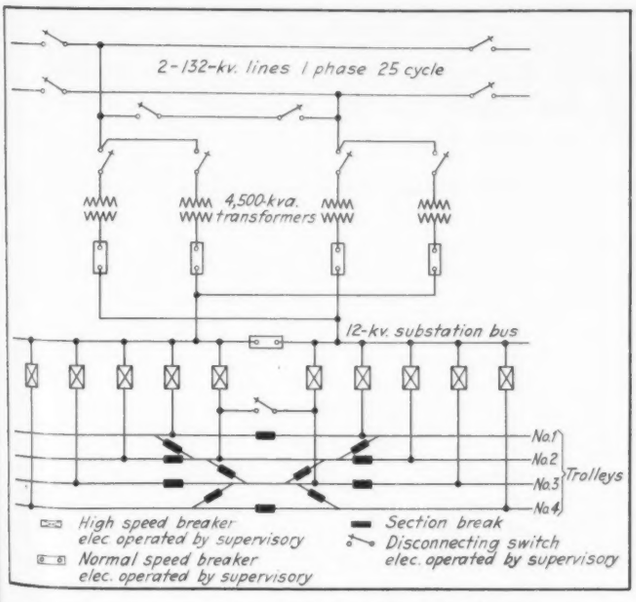
Flexibility of power transfer is assured by (a) the various supply sources, (b) four stepdown transformers (average) in each substation and (c) two feed points per trolley circuit. The 12-kv. substation bus is sectionalized with automatic protection on each section. Each trolley circuit is protected by a high-speed (one-cycle) breaker and the protective relays, which take care of numerous abnormal conditions, are of the most modern design.

Power for the signal system is supplied by 25/100-cycle, single-phase, frequency-changer sets located at various substations. The 440-volt generated voltage is stepped up to 6,600-volt signal line potential. Sufficient generating capacity is provided to take care of emergency conditions. Full automatic features are provided for starting and stopping of the signal frequency-changer sets, for energizing and de-energizing the 6,600-volt line feeders and for line sectionalizing.

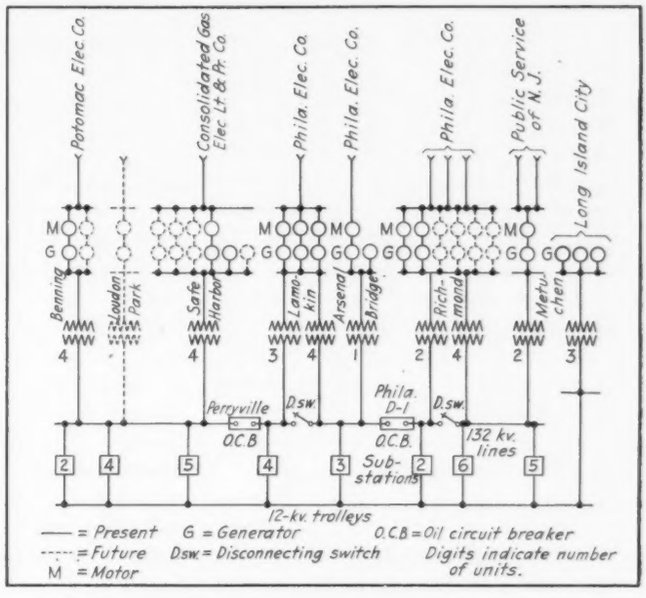
The various substations are unattended and between New York and Wilmington are in general controlled from nearby signal interlocking towers. Provision is made for local control from the substation when desired for maintenance and test work by properly qualified employees.

### *Zoned for supervisory control*

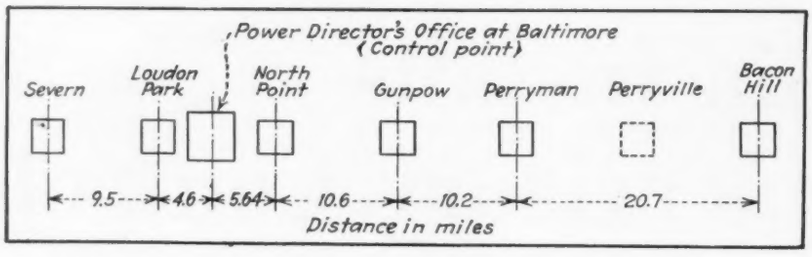
In order to assure reliable and efficient service, it is essential on an electrified railroad system to have means for rapid indication of circuit conditions and for rapid switching of the various circuits, because of load or short-circuit conditions on the various




Substation connections, Philadelphia-Washington area




Power supply points, New York-Washington area




**Distances between substations controlled by supervisory system**

branches of the system. The operation of an extensive electrified territory, such as that of the Pennsylvania Railroad, has required that the system be split into a number of zones. In each zone the supervision of the operation of all circuits is centralized under the control of one man, the power director for that zone. He is provided with a "model board," on which all of the transmission and trolley circuits in his zone are shown in miniature. The open or closed positions of all circuit breakers and switches are shown by green and red lamps on the model board, which he controls manually as the actual operation is performed. Thus, he has a visible indication of his system "set-up" at all times. He has direct telephone communications with all tower operators, each of whom has the actual control of a nearby substation. The switches and breakers are operated by the tower operator under orders from the power director. This method of operation has been found to be satisfactory where the substation is close enough to an interlocking tower to make direct control from the tower economical.

In several cases in the past the railroad has found the installation of direct electrical control uneconomical and has installed supervisory control equipment for the operation of a substation. This has been found to be efficient and reliable and considerably faster than relying upon the performance of operation through the interlocking tower operators. When the designs were being prepared for the extension of the electrification beyond Wilmington to Washington, it was found that the most suitable location for a number of substations would not be sufficiently close to an interlocking tower to make control from that tower economical.

### *Power director at Baltimore*

Having had sufficient experience with such a system as to be assured of its reliability, the Pennsylvania Railroad has installed a supervisory control and remote metering system for six substations south of Wilmington, thus placing the control of these stations directly in the hands of a power director.

The supervisory system not only provides control, but also calls to the attention of the power director what apparatus is in service or in trouble, and both visually and audibly informs him of emergency conditions and enables him immediately to restore power or rearrange the circuits by the simple operation of small control switches. It provides control and indication of the position of breakers and motor-operated disconnecting switches on transmission lines, transformers, circuits, trolleys, substation trolley bus tie and trolley sectionalizing circuits.

The power director's office, from which this supervisory system is operated, is located in the Baltimore passenger station. The initial equipment controls four substations north of Baltimore—Bacon Hill, Perryman, Gunpow and North Point, and two substations south of Baltimore—Severn and Loudon Park. Provision is made for control of additional substations in the future. The power director's office equipment consists of a 125-volt battery and six 90-in. high duplex cabinet type panels (one for each substation), with swinging panels at the rear.

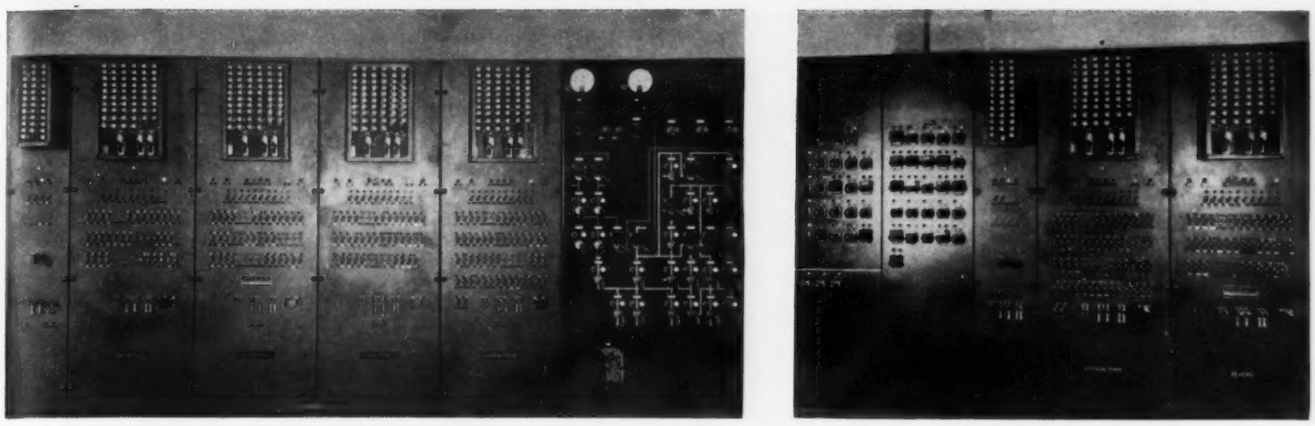
On the front of each panel are mounted a selector and relay unit for transmission and reception of the selection, operation and indication impulses, necessary operating keys and indication lamps. On the rear panels are mounted the polarized relays for energizing the various indicating lamps. Two additional panels contain the equipment for selecting and transferring the various substations to the spare line wires.

The substation equipment consists of a 125-volt battery, one 90-in. high vertical panel containing a selector unit similar to those in the power director's office and one 90-in. panel containing auxiliary relays for the closing or tripping of units controlled and for meter transferring. The number of control and metering points in the different substations varies from 50 to 64.

Sir pairs of No. 16 B&S wires have been assigned in the railroad company's underground communication cable north of Baltimore. Four pairs are used for control and indication of the four substations, the fifth pair is used as spare for all four stations and the sixth pair is used for telemetering of the four stations. Four pairs of wires are required south of Baltimore. Two pairs are used for control and incation of the two stations, the third pair is spare for both substations and the fourth pair for telemetering of both stations. The spare pair of wires can be transferred by the power director to any substation, one at a time. The successive operation of all stations is possible by the spare wires in case all the individual pairs of wires normally used are out of service at the same time.

A continuous line wire check is provided to call to the power director's attention by visual indication and bell alarm if the wires become open or short circuited. An emergency reset key is provided for resetting the con-

***Importance of 100 per cent reliability in operation of a railroad system that must handle more than 600 trains daily on exacting schedules can hardly be overemphasized. Reliability, safety and efficiency depend largely on continuity of power at the trolley. Having provided an adequate transmission system with appropriate insulation, high-speed relaying and breakers, it was logical that the same high quality of engineering should appear in the means for restoring service after temporary isolation of sections by automatic operation of protective equipment.***



**Supervisory switchboard in power director's office at Baltimore station**

trol equipment to zero under emergency conditions.

### *Sixty-four selections from six-impulse code*

Calculations indicate that the supervisory line wires will be subject to 440-550-volt-to-ground maximum induced potential (at 25 cycles) due to normal load currents and to 1,500-1,800-volt maximum potential due to short-circuit currents. The supervisory control equipment is designed to withstand an insulation test of 1,500 volts for one minute. To reduce the induced potential and to permit operation of the equipment during short-circuit conditions drainage equipment was provided for the line wires for draining off the induced potential so as to hold the induced potential under short-circuit conditions to a value between 500 and 600 volts.

In order to keep the number of wires extending over these exceptionally long distances to a minimum the two-wire code selector supervisory system was selected by the Pennsylvania Railroad. The code used for selective purposes is made up of a combination of positive and negative impulses. A code of six impulses is used to obtain 64 selections.

The power director can select any control point and automatically receive from the outlying station a check indication that the desired unit has been selected and that the position of the unit as indicated by the red and green lamps is correct. The selection check received is a series of code impulses, the same as that sent out from the power director's office to the outlying station to select the unit. An additional polarized impulse checks the red or green lamp indication. An amber lamp lighting on the power director's panel indicates to him that the correct selection has been made and that the equipment is ready for operation. A single polarity control impulse is used which results in fast operation. The power director can operate the selected unit as many times as desired without releasing the selection. To protect against false operation the circuit is so arranged that inductive surges or line-wire short circuits will not operate the control relays.

Indication of the position of supervised units is obtained by means of red and green lights on the power director's control panel. A white lamp lights whenever the supervised unit in the outlying station is in the position opposite to that shown by the control key. Indications of automatic operations are obtained on the power director's panel at a rate of about one every five seconds.

With automatic operation of a unit (as would occur in case of a short circuit) the power director immediately receives an audible and visual alarm signal telling him that a unit has operated, and the white lamp on his board, in conjunction with the green lamp, designates which unit has operated.

### *Telemetering also provided*

Telemetering equipment is provided for the following readings:

(a) 12-kv., 25-cycle substation trolley bus voltage.
(b) 125-volt substation control battery voltage.
(c) 125-volt supervisory battery voltage.
(d) 440-volt, 100-cycle signal generator voltage.
(e) 100-cycle signal generator current.
(f) Low-tension current of 132,000/12,000-volt substation stepdown transformers.

The telemetering readings are transmitted over a common pair of line wires, by means of one additional point on the supervisory system for each meter reading. Upon selection of a metering point by the power director, the instrument transformers on that circuit in the substation are automatically connected to the telemeter which transmits the reading to the receiving instrument in the power director's office. The standard rectified current telemetering equipment is used to transmit a.c. amperes and a.c. voltages from both the 25-cycle and 100-cycle systems. These indications can be left on continuously without blocking the use of any other part of the supervisory equipment except other metering points. The d.c. battery voltages are transmitted to the receiving instrument directly over the same metering wires.

Considering the frequency of operations on a large railroad system, the maintenance of the supervisory equipment is a relatively simple problem. Any slight adjustment or replacements, if necessary, can be taken care of without delay. The spare wires can be used in case of emergency. Supervisory control of the various substations permits the operating, maintenance and emergency forces to be co-ordinated into a more efficient organization than with the individual substation tower control. The power director knows directly at all times the actual conditions of the substations under his direct control and is immediately aware of the location and possibly of the nature of any trouble. There are also economic advantages in the supervisory control over the individual tower control. It decreases the number of men involved in operation of the power system, minimizes the possibility of a misunderstanding of system conditions and reduces performing of wrong operations by the large number of tower control operators involved.

# Trainshed Gets More Light

## How Adequacy of Illumination, Maximum Efficiency and Low Depreciation Were Assured in Remodeled La Salle Street Terminal, Chicago

By DAVIS E. TUCK
Electrical Engineer Holophane Company

**Remodeling of the three-year-old La Salle Street trainshed in Chicago, jointly operated by the C., R. I. & P. and N. Y. C. railroads, involved changes many of which would be applicable to similar structures in other cities. The revised illumination particularly is of interest. Parts of the trainshed that required special consideration and the method of selecting the lighting equipment and mounting position are discussed here.**

**The problem was one of balancing accident costs from underlighting against operating costs with adequate lighting. Conditions in trainsheds are peculiar to themselves, but there are trainsheds all over the country that deserve similar analysis.**

LIGHTING for trainsheds has always been important because if underlighted frequent accidents result, and if overlighted operating expenses are unnecessarily increased. Elimination of glare in trainshed lighting is very important, considering not only the safety and comfort of passengers but the effects of the light sources in the line of vision of locomotive engineers.

*Controlling Factors*—The illumination intensities at three positions in a trainshed must be given special consideration to assure safety and convenience to the passengers:

(a) Horizontal illumination at the floor level at the center of the platform.
(b) Horizontal illumination at the floor level just under the car steps.
(c) Horizontal illumination on the treads of the car steps.

Conditions (b) and (c) are most important from a safety standpoint, so greatly increased intensity is needed there at the lowest possible cost. This is aided by (1) using light-colored tread material on car steps, accompanied by dark-colored risers for contrast; (2) painting a light-colored band, approximately 2 ft. wide, on the trainshed platform, starting at the vertical projection of the bottom-step edge (see Fig. 2). Such a band is already provided on some platforms to mark the danger zone. It is estimated that the intensity of illumination can be tripled by these simple expedients.

*Selection of Units*—A preliminary step employed in selecting the lighting equipment was to draw scale elevations (Fig. 3) indicating the control points, the light source and the vertical candle-power distribution curves of equipment considered. Obviously only lighting units meeting mechanical requirements dictated by the severe conditions imposed were considered. By moving the candle-power curves up and down, while its axis coincides with the center line of the platform, the most advantageous mounting height for the particular reflector can be approximated and compared with the desirable mounting height from a mechanical viewpoint. As shown in Fig. 3, the desirable mounting height was 15 ft., whereas the platform width to be illuminated was approximately

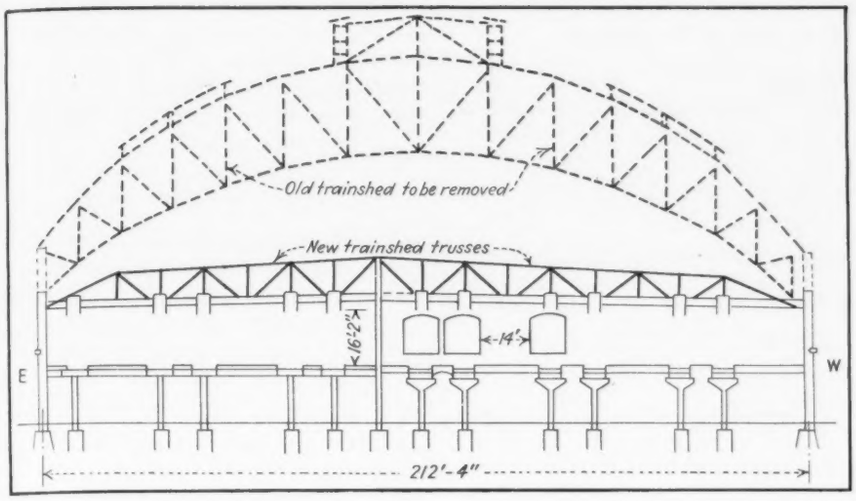



**Fig. 1—Revision of roof trusses influenced attachment and distribution of lighting units**

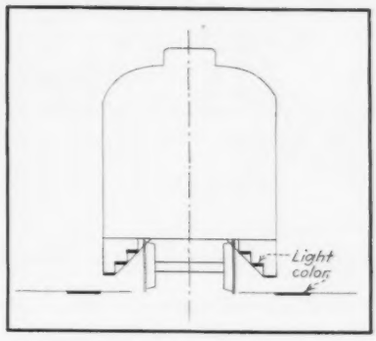



**Fig. 2—Light-colored step treads and borders on platform aid illumination**

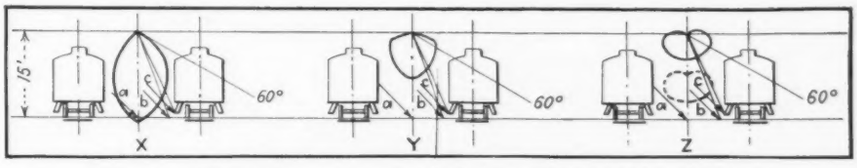



**Fig. 3—Distribution curves of lighting units considered using 200-watt clear lamps**
Illumination at points b and c is particularly important

14 ft. It is evident that conditions "Y" and "Z" would give considerable glare because the relatively high flux intensities in 60-90 deg. zone are directly in the line of vision of passengers and locomotive engineers. Furthermore, light above 60 deg. does not produce useful illumination. Condition "X" does not produce high candle-power values in the glare angle and does direct more light on the three controlling locations (a), (b) and (c) than conditions "Y" and "Z." This is further illustrated in Table I.

### *Height given consideration*

By lowering the units represented in "Y" and "Z" more light would be concentrated on the important locations. However, this would necessitate closer spacing of light centers at increased cost and the appearance of the platform would be detracted from.

Most important, however, is the installation of trial equipment under the same conditions as required under trainshed operation. Two or more of each type of unit to be tested and compared were mounted at the same heights and connected with separate controls. They were fitted with identical lamps—wattage, glass and voltage. As an added refinement, the units were hung from pulleys so the mounting height could be varied. Measurement of line voltage at the time of test was made for comparison, with required lamp voltage. After nightfall light-intensity readings were made at the control points mentioned (Fig. 4) with each type of unit. Care was taken to prevent inclusion of light from sources other than that being tested. Table II illustrates the values for units whose candle-power distribution curves are shown in Fig. 3.

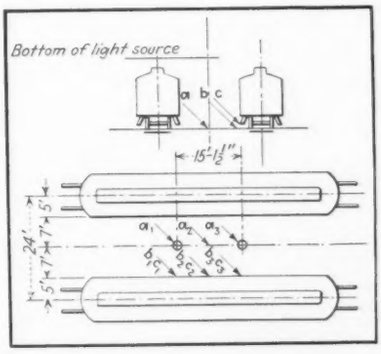



**Fig. 4—Positions at which illumination was tested**

In the interest of maintenance and general utility, it was essential that the lighting units have the following mechanical qualifications:

1. Easily cleaned and relamped by one man.

## Table I—Candle-powers Directed Toward Three Important Positions Affecting Convenience and Safety

(Values taken from candle-power distribution curves of reflectors)

| Condition | (a) Platform | Candle-Power Toward Car Floor at Step (b) | Step (c) |
|---|---|---|---|
| X | 1,100 | 810 | 790 |
| Y | 550 | 500 | 480 |
| Z | 300 | 320 | 320 |

## Table III—Low Depreciation in Lighting Shown After Six Months Service

| Date of Test | Mounting and Height (ft. and in.) | Foot-Candles at Observation Points $a_1$ | $a_2$ | $a_3$ | $b_1$ | $b_2$ | $b_3$ | $c_1$ | $c_2$ | $c_3$ | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/16/34 | 14–6 | 4.0 | 4.5 | 4.5 | 3.0 | 3.6 | 3.0 | 3.3 | 3.8 | 3.4 | Test installation |
| 10/25/34* | 14–6 | 4.33 | 4.05 | 4.40 | 3.03 | 3.01 | 3.00 | 3.20 | 3.00 | 3.05 | Actual lighting after 5-mo. service |
| 11/ 8/34* | 14–6 | 4.83 | 4.43 | 4.75 | 3.35 | 3.31 | 3.30 | 3.40 | 3.38 | 3.40 | Actual lighting after cleaning |

*Average values

## Table II—Illumination at Important Positions on Platform and Steps

| Type Fixture | Lamp Size (Watts) | Foot-Candles at Important Positions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $a_1$ | $a_2$ | $a_3$ | $b_1$ | $b_2$ | $b_3$ | $c_1$ | $c_2$ | $c_3$ |
| X | 200 | 4.3 | 4.4 | 4.3 | 2.8 | 3.4 | 2.8 | 3.6 | 4.1 | 3.2 |
| Y | 200 | 3.4 | 3.6 | 3.4 | 2.8 | 2.8 | 2.8 | 3.2 | 3.1 | 3.2 |
| Z | 200 | 1.0 | 1.4 | 1.0 | 1.1 | 1.2 | 1.0 | 1.2 | 1.4 | 1.0 |

## Table IV—Intensity of Platform Illumination at Different Positions in Trainshed

(200-Watt 120-Volt Lamp. Holophane Vapor-Proof Unit 02338-AL. Test Made Oct. 24, 6 P.M.)

| Location of Test: Platform No. | Location of Test: Column Line | Foot-Candles at Observation Points | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $a_1$ | $a_2$ | $a_3$ | $b_1$ | $b_2$ | $b_3$ | $c_1$ | $c_2$ | $c_3$ |
| 17 | No. 2 about 60 ft. from north end of shed | 4.7 | 4.4 | 4.7 | 3.7 | 3.6 | 3.7 | 3.8 | 3.7 | 3.9 |
| 14 | No. 2 about 121 ft. from north end of shed | 4.3 | 4.2 | 4.5 | 2.9 | 3.1 | 3.0 | 2.9 | 3.1 | 3.0 |
| 11 | No. 6 about 182 ft. from north end of shed | 4.6 | 4.2 | 4.8 | 3.3 | 3.0 | 3.0 | 3.9 | 3.1 | 3.0 |
| 8 | No. 11 about 333 ft. from north end of shed | 4.0 | 4.0 | 4.4 | 3.0 | 3.0 | 2.9 | 3.0 | 2.6 | 3.0 |
| 5 | No. 16 about 486 ft. from north end of shed | 4.0 | 3.5 | 3.6 | 2.4 | 2.2 | 2.4 | 2.6 | 2.3 | 2.4 |
| 2 | No. 18 about 547 ft. from north end of shed | 4.4 | 4.0 | 4.4 | 2.9 | 3.2 | 3.0 | 3.0 | 3.2 | 3.0 |
| Average over shed | | 4.33 | 4.05 | 4.40 | 3.03 | 3.01 | 3.00 | 3.20 | 3.00 | 3.05 |

2. Practically dust-tight and vapor-proof.
3. Light in weight and made with a minimum of hinges, adjusting mechanisms, etc.
4. Made of materials which are resistant to fumes, gas and moisture conditions prevalent in trainsheds.
5. Pleasing appearance.

The fixture selected is Holophane unit No. 02338-AL.

This unit consists of a combination vapor-proof glass globe and reflector. Prisms on the upper portion reflect the light downward through the lower portion, which diffuses it. The two glass members are fused together, the joint covered by a spun aluminum band. An aluminum cover spun over the entire upper member further excludes dust, etc., and prevents radiation of light within range of the locomotive engineer's vision. The flat glass light-emitting disk with its smooth exterior surface makes cleaning a simple matter.

The upper portion of the globe is threaded for an aluminum-alloy vapor-proof fitting, a composition ring gasket cushioning the contact surfaces and assuring dust tightness. Weighing only 10 lb., the units are easily handled by one man when relamping and cleaning.

The fixtures were suspended with ½-in. galvanized iron pipe fitted with a swivel top to permit adjustment to a true vertical position. Spacing of the 233 units employed was fixed at 15 ft. 1½ in. (centers) and the average mounting height was 14 ft. 6 in. The lamps used are 200-watt, 120-volt, clear-glass bulbs operated with an average voltage of 115.

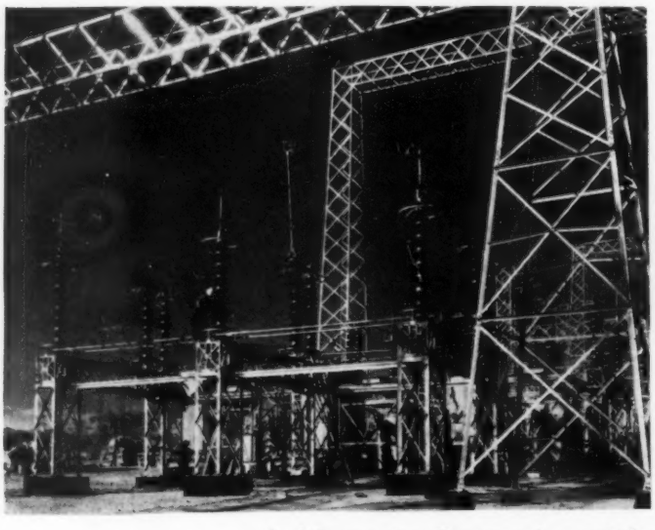
### *Flexible remote switching*

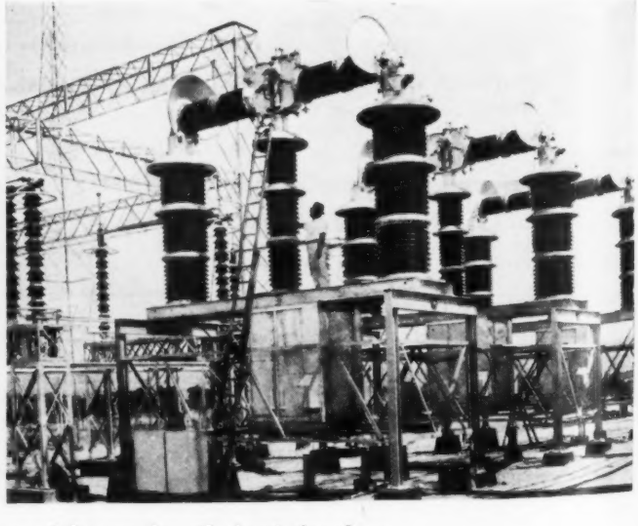
To keep energy costs at a minimum, a flexible, remote-control switching system was installed so that illumination is provided only where needed to suit the variable nature of terminal business.

After the system had been installed six months a check was made to determine light depreciation before cleaning and subsequent increase in illumination after cleaning. The results of these tests, made so as to indicate average intensity over entire trainshed, are shown in Tables III and IV.

All the design, construction and removal work, as well as supervision of illumination tests, was carried out under the direction of I. L. Simmons, bridge engineer Chicago, Rock Island & Pacific Railway; B. R. Leffler, bridge engineer New York Central Railroad, as associate. A. E. Greenawalt, electrical engineer New York Central, and H. E. Gilbert, superintendent W. A. Jackson Company, electrical contractors, who installed the lighting system, contributed valuable service in the illumination tests. The entire project was handled under a general contract by the Ellington-Miller Company, Chicago.

## INSTALLING 287-KV. EQUIPMENT ON BOULDER DAM LINE





**At left are the disconnecting switches; at right are the oil circuit breakers. These views are of the Victorville switching station**

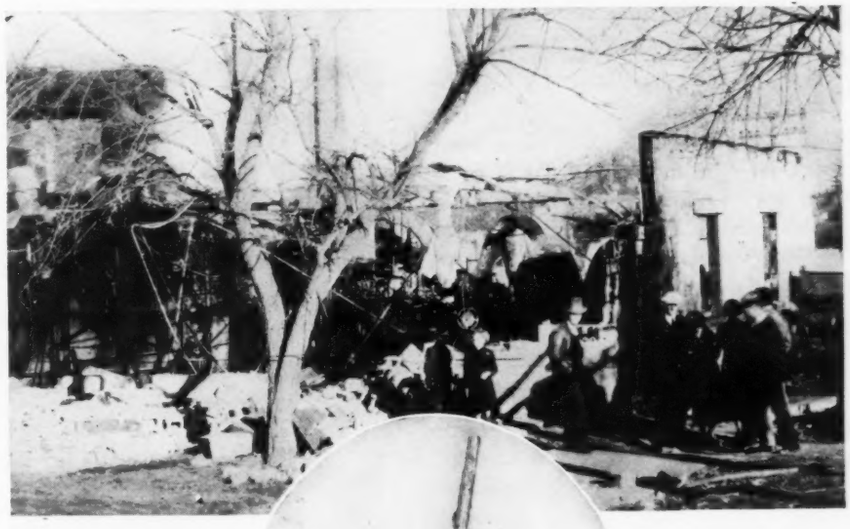
# Rush Service for Sutton

## Using Resources of Wide-Flung System, Private Power Company Builds Substations and Transmission Line in Four Days to Restore Service of Municipal Utility

"SUTTON'S fire-ravished electric system was restored to service at 10:55 Sunday evening, with current supplied by the Iowa-Nebraska Light & Power Company—climaxing a breath-taking race against time in which more than 100 skilled line construction men erected two substations and built a 9½-mile transmission line from Grafton to Sutton in four days. Trained crews from seven of the company's fourteen districts battled rain, mud and cold in their efforts to smash all records for speed in construction work in restoring light and power to the darkened city." So speaks the Sutton (Neb.) *Register*.

On the night of Tuesday, December 3, Sutton's municipal electric plant was destroyed by fire. It would have taken a month at least, and probably longer, to procure and install replacement generating capacity. In their extremity the town officers turned to the utility company, whose lines were about 10 miles away. Early Wednesday morning an officer of the company was on his way from Lincoln to Sutton with power to act and by 5:30 that afternoon the matter was arranged. The contract provided for service within seven days, with the company saying unofficially that the job could be done in five days if things went well. Actually the electric lamps of Sutton blazed again into light Sunday evening, only four days after the contract was signed. Let the *Register* speak again:

> Within ten minutes after the agreement had been completed work was under way, with officials of the company working all night organizing man-power, procuring equipment and trucks, loading material and rushing workers to the job. President Lowell R. King of the company and R. A. Graham, manager of the York district, rushed crews of skilled workers from Beatrice, York, Plattsmouth, Lincoln and Seward, Neb.; Red Oak and Clarinda, Iowa. Because of the company's large territory, which is divided into fourteen districts, with operating and construction crews working in each district, it is possible to recruit a large force of experienced workers within a few minutes and crews were on the way within less than an hour.



**The catastrophe**

Fire started in a garage next door to the plant. The garage housed the town's fire-fighting equipment, which was burned up. So there wasn't much chance to stop the fire when it spread to the electric plant.

**Digging machine made the job possible**

**Stringing the wire**

Because of the company's large resources practically all of the material needed for the job was in readiness in its own storerooms. Only extra poles and wire were needed. Wire was shipped from Illinois to Omaha and transferred from there to the scene of action in fast company trucks, a distance of 175 miles. Poles were rushed by fast freight from Minneapolis. Induction voltage regulators were hauled 200 miles from Clarinda, Iowa. Transformers were delivered from Lindsay, Pawnee City and Tobias, Neb. Hardware and insulators were hauled from Avoca, Iowa, and Humboldt, Neb. Two digging machines, each capable of digging a pole hole every eight minutes, were used. All equipment was ordered and on the job within 24 hours.

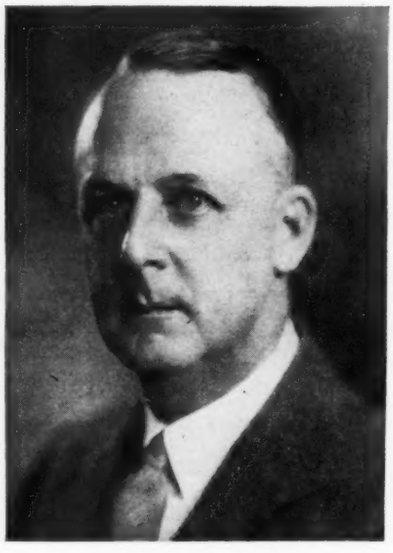
# Building Small-Customer Load

## Alabama Power Company Has Concentrated on the Minimum Bill Consumer, Using the Small Chest Refrigerator as the Spearhead in Its Selling

THAT ancient bugaboo the unprofitable customer is gradually being overcome by the utilities. Alabama Power Company has been doing an outstanding job. The company serves virtually the entire state of Alabama, a vast territory comprising 48,000 square miles. Birmingham is the only large city in the state not included in its merchandising activities. During 1934 its 75,000 residential customers consumed an average of 871 kw.-hr. per customer, a figure considerably above the national annual average of 631 kw.-hr.

Due largely to its aggressive merchandising methods, under the direction of J. S. Sutherland, sales promotion manager, the company at present is increasing its average monthly domestic kilowatt-hour consumption at the rate of about 10 kw.-hr. per customer. This large increase is being made despite the fact that Alabama Power operates almost exclusively in small towns and that the company has strong natural gas competition throughout its territory. In the largest merchandising division, in which the city of Montgomery is located, the average annual kilowatt-hour consumption by domestic users is 955, while domestic consumption in the Mobile division, second largest, averages 901 per year.

In the merchandise sales program the state is divided into six divisions, embracing the 487 communities served by the utility. Roughly, the activities consist of selling appliances through 77 company-owned-and-operated stores strategically located throughout the state, through 139 co-operative dealers and through training and effective use of the company's 1,500 employees as appliance salesmen. The company has 40 full-time domestic salesmen and recently added eight full-time commercial salesmen for a more intensive cultivation of the commercial refrigeration field. There is a staff of seventeen home service girls, headed by Miss Susan Brandon. Three sales coaches cover the state.



**J. S. Sutherland**
Sales Promotion Manager
Alabama Power Company

Of Alabama Power's 75,000 domestic customers, about 60 per cent, or 45,000, use less than 50 kw.-hr. of current per month. These 45,000, all not necessarily unprofitable, are termed "submerged accounts," and efforts to increase the use of electrical appliances and lighting are centered on this group. During the year ended August 31, 1934, customers of the company using less than 50 kw.-hr. per month increased their kilowatt-hour consumption 13½ times faster than its higher-bracket accounts.

**Small customers must be weaned from their scant use if they are to be transferred to the pay-your-way class. Alabama finds that it can be done, and refrigerators not too far removed from the traditional ice box have started the weaning process nicely on its way.**

The most effective attack upon the low-consumption domestic customer was made with the low-priced G. E. "Liftop" refrigerator. An experimental Liftop sales activity was inaugurated last November and in a few weeks approximately 200 were sold, which definitely established its market possibilities. The initial merchandising efforts were confined to three towns, the largest being Gadsden, a city of 24,000 population, in which were sold about 100 Liftops, the other 100 being sold in much smaller communities. The great majority replaced old ice boxes.

Mr. Sutherland says: "In our experimental merchandising operation we used our regular sales force. We took the refrigerator direct to homes. Our sales story was that the Liftop was so economical that people couldn't afford to be without it. The machines were sold almost exclusively to a very low-income group. Chief resistance on the part of prospects was that they could not afford electric refrigeration. This argument was overcome by showing them that the Liftop could be paid for in small monthly installments and that by actual meter tests in homes of numerous users it had been found to consume only 25 kw.-hr. per month, a part of which was 'free' under the 'objective' rate plan of the company. One big point which we put over at the initial presentation was that the Liftop had sufficient capacity for the average small or medium-sized family. Our men, in making their demonstrations, never failed to transfer the contents of the prospect's ice box to the Liftop, which always accommodated

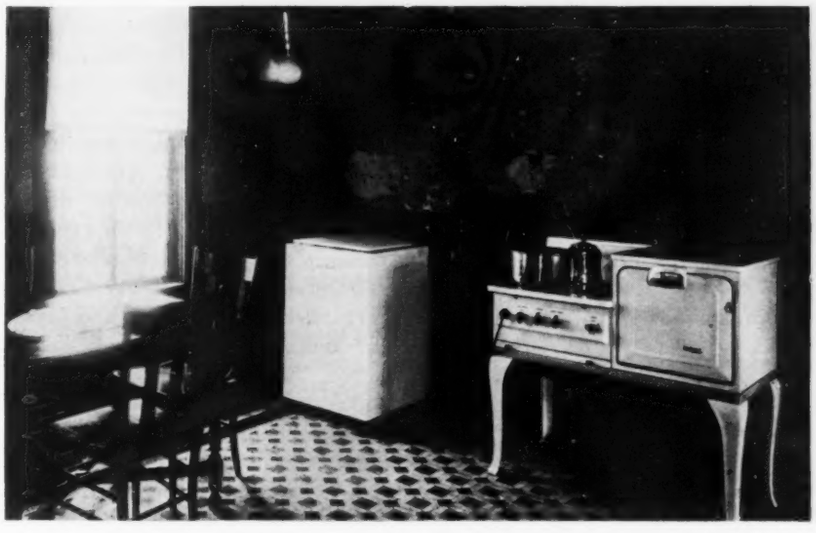
the provisions. They closed the demonstration by leaving the refrigerator with the prospect with the understanding that they would call at the end of a week and remove it. *In nine out of ten demonstrations the prospect bought the machine after the week's trial.* Purchasers were highly pleased and virtually all agreed that the Liftop has sufficient capacity, or at least equal or greater capacity than their ice boxes, and that it preserved food much better.

"Not all of our sales have been confined to the modest income group, however, as we have sold a few to owners of large electric refrigerators as an auxiliary box, and a few to roadside barbecue operators. We have set up a quota of 1,000 Liftops for 1935."

In June, 1934, Alabama Power inaugurated a three-year new-business activity program, setting as a goal, among other things, the sale of 39,000 electric refrigerators, 12,000 electric ranges and 6,500 electric water heaters. Under this program the company plans on selling 13,000 refrigerators this year, about one-half to be sold through its own organization and one-half through its co-operative dealers. By accomplishing this result a 70 per cent refrigeration saturation of the territory served will have been reached in 1937. An idea of the exceptional job this utility is doing in merchandising electrical appliances may be had from the fact that approximately $1,200,000 worth of appliances were sold in 1934, a gain of about 80 per cent over 1933. Refrigerator sales were almost doubled during the year. The company's merchandising policy is to concentrate on selling certain appliances at special periods during the year, and not adhere to a general concentration on all appliances throughout the twelve months.

**Home of typical minimum-bill customer, upon which Alabama Power Company is concentrating in its appliance merchandising program**

Ben Mount, Alabama City, Ala., the owner, has installed a G.E. "Liftop" refrigerator and electric range.



**G.-E. "Liftop" refrigerator and electric range in home of Mr. Mount**

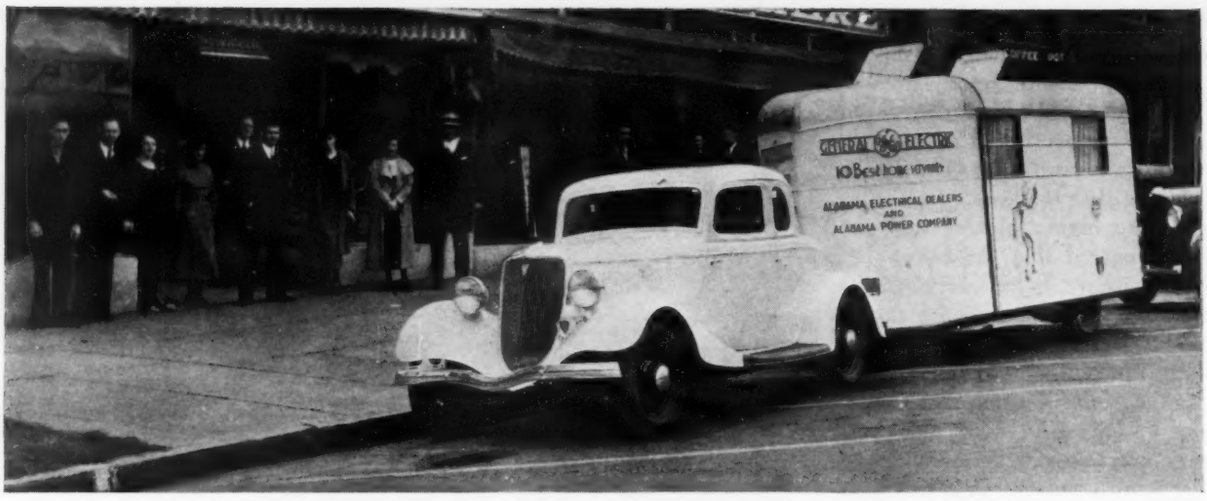
### *Sales coach large factor*

Alabama Power's outstanding success unquestionably is due in large measure to its aggressiveness, and especially in developing low-current-consuming customers. The co-operative dealer program and the use of sales coaches are good examples of the more modern methods employed. The sales activities are supported by an extensive advertising program, including use of approximately 150 daily and weekly newspapers, in which appliance merchandising copy is published consistently through the year.

Sutherland is a strong advocate of using the company's 1,500 employees in merchandising. They are trained to sell and most of them do—to the extent that approximately 60 per cent of the company's appliance sales are made by employees, with the remaining 40 per cent being accounted for by the utility's full-time salesmen, plus the work of co-operative dealers. It's Sutherland's boast that during *one* month last year every regular employee on the payroll sold more than $5 worth of merchandise. About 800 employees are paid commissions regularly on appliance sales. Twelve sales campaigns are conducted each year, with special prizes for outstanding sales performances.

Alabama Power's co-operative dealer plan, inaugurated two years ago, has proved eminently successful and is being extended rapidly to all sections of the state. The utility assists its co-operative dealers in merchandising appliances by training their sales personnel and by developing sales promotional plans to increase dealer business. Under certain conditions the utility guarantees successful operation of appliances sold by dealers for one year and services them. The utility also assumes the cost of installing electric ranges and water heaters sold by co-operative dealers.

The three sales coaches are a further step in co-operating with dealers and the sales staffs of its 77 company-owned stores. Each coach is manned by a sales supervisor and a home-service girl. The coaches have completed their first circuit of the utility's terri-




**One of three General Electric Sales coaches operated by the Alabama Power Company**
Coach is parked in front of company's Tuscaloosa store

tory, their initial appearance being responsible for 6,100 appliance prospects for immediate sales. The prospects are followed up by resident sales heads, whose function it is to close the sales. These coaches are equipped with refrigerator, range, water heater, pumps and small appliances. On arriving in a town the coach traverses the principal streets, the driver using a megaphone to announce the arrival and purpose of the visit. The coach parks on the main street and always attracts many prospects.

### *Garden parties set refrigerators moving*

In the summer the company has also employed an unusual method in promoting refrigerator sales by holding a series of garden parties in the larger towns. The parties are held on the lawns of the finer homes, with elaborate lighting installations illuminating grounds and buildings. All refreshments are served from three demonstrator refrigerators. Thousands of people attend. Record attendance was 14,000 for three nights in Mobile. Several hundred refrigerators were sold last summer as a result. Sales of 36 refrigerators in four days were traced directly to the first of the garden parties, held on the lawn of a fraternity house in Tuscaloosa, home of the University of Alabama. Sutherland plans to extend the garden party idea this coming summer.

Incidentally, the utility kills two birds with one stone with its garden parties by selling decorative lighting as well as refrigerators. Frequently the owner of the home where the party is held purchases the lighting equipment, while hundreds of other prospects for garden lighting are secured as a result.

Miss Brandon, director of home service, has a rather revolutionary idea concerning refrigerator and range demonstrations. She believes in starting where the orthodox demonstration stops. Consequently, Alabama Power demonstrations start with the completely cooked meal in the range, with desserts and other cold dishes in the refrigerator, ready to serve. The home-service demonstrator then explains to the audience how the foods were prepared. She has found this plan more successful than demonstrating the step-by-step method in the preparation of meals and is inclined to the belief that the regular cooking school is no longer a novelty or the attention holder it used to be.

The promotion of better home lighting also is well organized. Twenty-two home-lighting salesmen are assigned 2,700 residential customers each, with Sightmeters and demonstration kits. During 1934, 28,050 homes were contacted; these developed a load of 4,428 kw., an average of 153.6 watts per call, and they are estimated to use 3,432,407 kw.-hr. annually. A field survey of 132 meters revealed that the work of the home-lighting salesmen increased the consumption of the average small user of current from 31.1 kw.-hr. to 38.6 kw.-hr., or 23.1 per cent.

Another activity is the "special service crew," consisting of six men, including a working foreman. Each man is uniformed and carries a letter of identification, a kit of small tools and a few repair parts. A larger stock of repair parts is left in the car. These men canvass all customers using 46 kw.-hr. per month or more and customers using less than this amount known to own major appliances. Where equipment is found out of service, due to being out of order, these repair men are authorized to make repairs on the spot, without charge, provided the cost of repair parts does not exceed $1.50 per customer.

### *No repairs on flimsy appliances*

No repairs, with the exception of occasional replacement of cord and plug, are made on appliances of obviously "cheap" grade, such as those generally sold by 10-cent stores and drug stores, however, because it has been learned that as a rule it is impossible to repair satisfactorily such appliances, due to their flimsy construction. Major repairs are not attempted by the special service men, nor is any work done on interior wiring, switches, baseboard outlets, permanently attached lighting figures, meters, radios, door bells, electric toys, clocks, medical or dental equipment. During the past year about 51,000 appliances were inspected by this special service crew. As a result of this activity, 7,744 appliances "on the shelf" for some reason or other were placed back in service by customers.

Alabama Power's new-business department is a smooth-running, efficient organization. The best proof of this is that the department is paying the company attractive dividends in the way of profits. And of greatest import, it is steadily building the domestic load by inducing low-current-consuming customers to make greater use of electricity.

# Tests Check New Manhole Cover Designs

## Flat-Plate Cast-Steel Covers Found to Give Better Performance Than Those With Ribs

By J. M. COMLY
Assistant Engineer
Brooklyn Edison Company

EXTENSIVE tests on complete manhole covers of different designs have led to the conclusion that the flat-plate, cast-steel design is superior to the ribbed design. For a given weight of material it has higher resistance to impact loads, equal carrying capacity for static loads and gives indication of distress by dishing before failure under excessive load occurs. Other conclusions are:

Ribbed designs tested, whether of steel or iron, concentrated stress in the ribs, resulting in progressive failure under excessive loading.

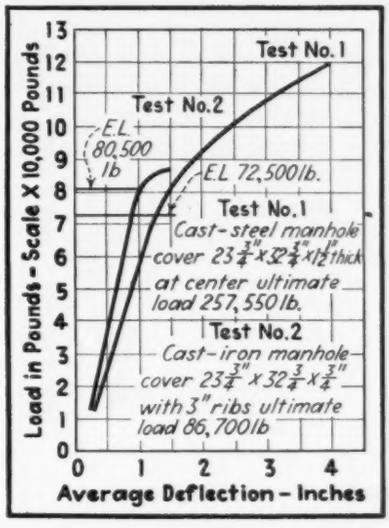
The nickel-iron design failed on excessive loading with little or no warning.

All the covers showed a considerable percentage of strength above the requirements.

The lighter flat-plate design, 210 lb., can safely replace the older designs, which weighed 260 lb. or more.

The series of tests on which these conclusions are based may be divided into three sets. The first set consisted of static load tests on several designs of cast-steel and cast-iron covers. The loads were applied through steel blocks with contact areas 4x17 in. placed with the long axis parallel to the long axis of the cover. Results for 23¾x32¾-in. rectangular covers are given in Table I.

The second set of tests, made a few years later, consisted of similar static load tests on covers made in accordance with designs worked out during the interim. All of these covers were rectangular in shape, 23¾ in. wide by 32¾ in. long. One group was designed for cast steel in the flat-plate form used in 1929, but somewhat lighter. The two others were designed with reinforcing ribs, one for cast steel and the other for nickel cast iron. For comparison a fourth group of flat-plate, cast-steel covers of the same design as those tested in 1929 was included.


Load in Pounds - Scale X 10,000 Pounds
Average Deflection - Inches
Test No. 1
Test No. 2
E.L. 80,500 lb
E.L. 72,500 lb.
Test No. 1
Cast-steel manhole cover 23¾" x 32¾" x 1½" thick at center ultimate load 257,550 lb.
Test No. 2
Cast-iron manhole cover 23¾" x 32¾" x ¾" with 3" ribs ultimate load 86,700 lb

**Steel cover has three times ultimate strength of cast iron**
Breaking point for iron cover at load only slightly above yield point of cast-steel cover.

The results of the tests given in Table II must be considered in the light of the facts that tests on the material of the various covers showed the steel to have a tensile strength of 88,000 lb. instead of 70,000, as ordered, and the nickel cast iron a tensile strength of 32,000 instead of 40,000 as ordered. The excess strength of the steel appeared to be due to an unusual refinement of grain and cannot be expected in ordinary practice.

Static loads were applied to each cover as before. During the test the covers were supported by a frame similar to that used in the street installations.

The third set of tests consisted of impact tests made on samples of the same designs included in the second set. These samples were cast at the same time as those used in the static load tests just described and may be considered to be of the same strength. The comparison of the effect of static and impact loads on the various designs should not, therefore, be clouded by the effects of differences in the material of the samples.

The impact tests were made by dropping a 9,000-lb. block of steel from various heights onto the 4x17-in. loading block placed on the test sample with its long

[*Continued on page 78*]

### Table I—Static Load Test Results

| Test No | Type and Design | Size | Material | Elastic Load in Pounds | Limit Deflection in Inches | Ultimate Load in Pounds |
|---|---|---|---|---|---|---|
| 1 | Rectangular, flat plate..... | 23¾x32¾ in., 1½ in. thick at center | Cast steel | 72,500 | 0.13 | 257,550 |
| 2 | Rectangular, ribbed..... | 23¾x32¾x¾ in. with 3 in. ribs | Cast iron | 80,500 | 0.10 | 86,700 |

### Table II—Summary of Static Load Test Results

| Rectangular Covers 23¾x32¾ In. | Apparent Yield Point Load in Pounds | Apparent Yield Point Deflection in Inches | Maximum Load Applied Breaking Load, Lb. | Maximum Load Applied Test Halted, Lb. | Maximum Load Applied Deformation in Inches |
|---|---|---|---|---|---|
| Flat-plate, cast steel. The same as that tested in 1929. Thickness at center 1½ in. Weight 211 lb. = 100% | 106,000 | 0.204 | ..... | 300,000 | 1½ |
| | 118,000 | 0.220 | ..... | 300,000 | 1 7/16 |
| | 112,000 | 0.196 | ..... | 300,000 | 1½ |
| Ribbed cast steel as designed for these tests. Weight 163 lb. = 77% | † | † | 173,000 | 240,000 | 2 1/16 |
| | 77,000 | 0.200 | 202,000 | ..... | ... |
| | 66,000 | 0.150 | 176,000 | ..... | 1½ |
| Flat-plate, cast steel as designed for these tests. Thickness at center 1¼ in. Weight 169 lb. = 80% | 77 000 | 0.236 | ..... | 265,000 | 2⅛ |
| | 75,000 | 0.210 | ..... | 265,000 | 2⅛ |
| | † | † | ..... | 300,000 | 2⅜ |
| Ribbed, nickel cast iron as designed for these tests. Weight 214 lb. = 101% | None | 0.095* at | 105,000 | ..... | ... |
| | | | 113,000 | ..... | ... |
| | None | 0.070 | 69,000 | 81,500 | ... |
| | None | 0.060* at | 64,000 | ..... | ... |
| | | | 95,000 | ..... | ... |
| Ribbed malleable cast iron submitted by manufacturer. Weight 167 lb. = 79% | 76,000 | 0.090 | 145,000 | ..... | ... |
| | 81,000 | 0.108 | 149,500 | ..... | ... |

*Last reading taken—gage removed just before failure. †Not well defined.

# Resistance Welds Widely Used

## Characteristics of Butt, Flash, Spot Projection and Seam Welding—Indications of Fields Where Successfully Adapted

*Developments in electric welding have been so extensive and applications of the various modifications have become so diversified that hardly a manufacturing or metal fabricating plant exists that does not use electric welding for some production process. Fabrication has been so greatly simplified, expedited and cheapened thereby that no industrialist can afford to overlook possible applications. Some of these involving resistance welding are considered here with the types of welders which are best adapted to the work. All engineers and power salesmen should find this article of value.*

**By GEORGE H. HALL**
Consulting Engineer, Douglaston, N. Y.

WITH the development of electric welding the art of uniting two or more pieces of metal by the application of heat and pressure passed from its hitherto limited field of application to one so extensive that within a comparatively few years electric welding has become one of the major processes in the manufacturing field. It has made possible quantity production on a scale never before contemplated. Manufacture of automobiles, refrigerators and farm implements, the erection of steel building frames and pipe lines and the construction of many classes of railroad work are thereby accomplished in a far more rapid, more efficient and less expensive manner than is possible by any other means.

In general, resistance welding is a production process and arc welding a construction process, although an overlapping of these two general classifications may, at times, be encountered. Resistance welding is essentially an alternating-current process. In a few limited cases three-phase power has been used, but the majority of resistance welding machines are operated on single phase. Since a transformer is required for reducing the supply voltage to a value suitable for welding work, any commercial voltage may be used for the primary of the transformer.

*Butt and Flash Welding*—In butt welding the two pieces of metal to be welded are held in clamps connected to the secondary side of the welding transformer. Initially the pieces are brought into slight contact. As current flows the resistance of the pieces generates enough heat to bring them to the fusing point, when they are brought together under heavy pressure and the weld formed.

For a successful weld it is essential that the ends of the pieces shall be parallel, to insure even heating, and free from dirt or other foreign matter which would cause oxidation and faults in the weld. However, the necessity of such careful preparation has been largely obviated by the development of flash welding.

If the ends of the pieces to be welded are drawn a very short distance apart (about the thickness of a sheet of paper) after the first contact is made the heating will be concentrated within about $\frac{1}{16}$ in. from each end and will be accompanied by actual burning of the tips. A magnetic blowout effect will also be produced which throws out sparks and other products of combustion, preventing oxidation and accumulation of foreign matter on the surfaces to be contacted. This burning, or flashing, very quickly causes the two surfaces to become parallel, so that full contact is insured when the

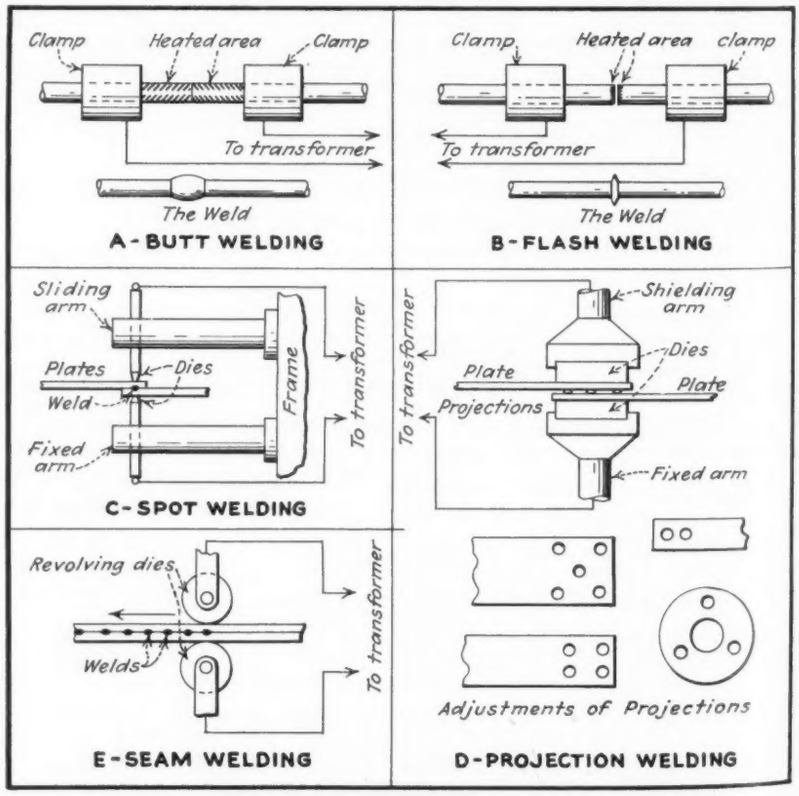



**Fig. 1—Principles of different types of resistance welding**

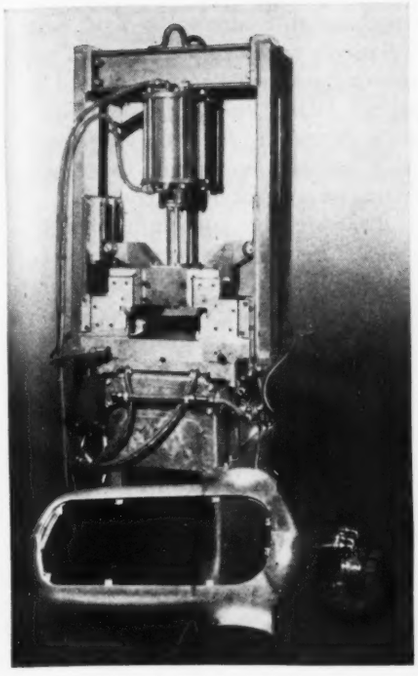


**Fig. 2—Flash welder with vertically operated ram**

Welds two pressed steel parts to form a complete automobile radiator shell. Parts held in clamps and pressure applied by compressed air cylinders. Two complete welds, one on each side of the shell, are made simultaneously.

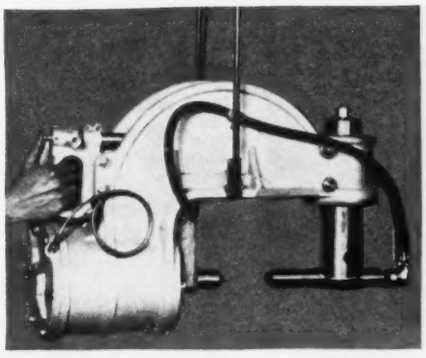


**Fig. 4—Portable spot welder**

With thumb head depressed, air cylinder moves head die into contact with work. When sufficient pressure is reached current is automatically sent through the dies and work, and cut off as soon as weld is completed, regardless of length of time trigger is pressed.

*Four photos courtesy Thomson-Gibb Electric Welding Co.*

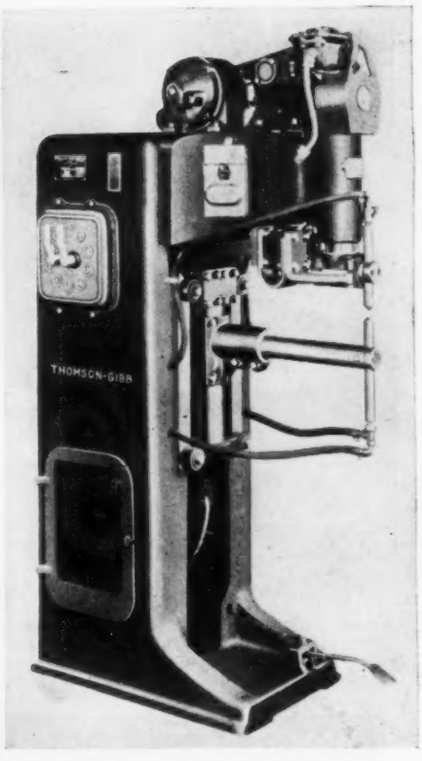



**Fig. 3—Conventional spot welding press**

For high-speed production welding of light and medium gage stock in a wide variety of metals. Cam-controlled press action. Regulator provides sixteen changes of heat.

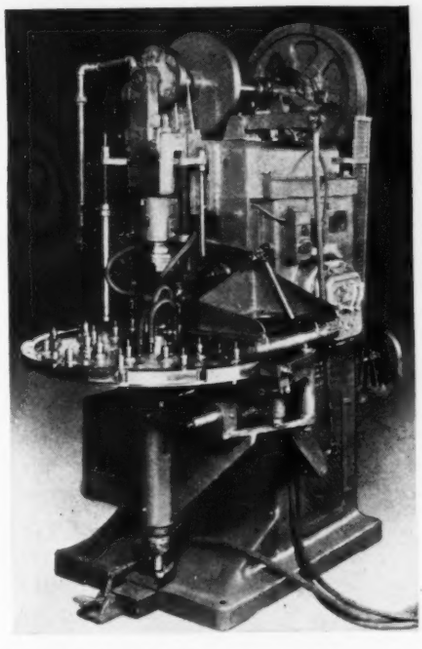


**Fig. 5—Special projection welding press with dial feed**

Reinforcing washers are projection welded to automobile brake shoes. Makes twelve projection welds per cycle at a rate of 30 cycles per minute, averaging 360 projection welds per minute.

pieces are brought together. While this burning is taking place the clamps are moved slowly together to maintain a constant air gap. As soon as the tips are burned clean they are brought into contact under heavy pressure, as in butt welding, and the weld is completed. The bulge at the point of welding is much smaller than that in the butt weld and is consequently easier to remove when a smooth joint is desired.

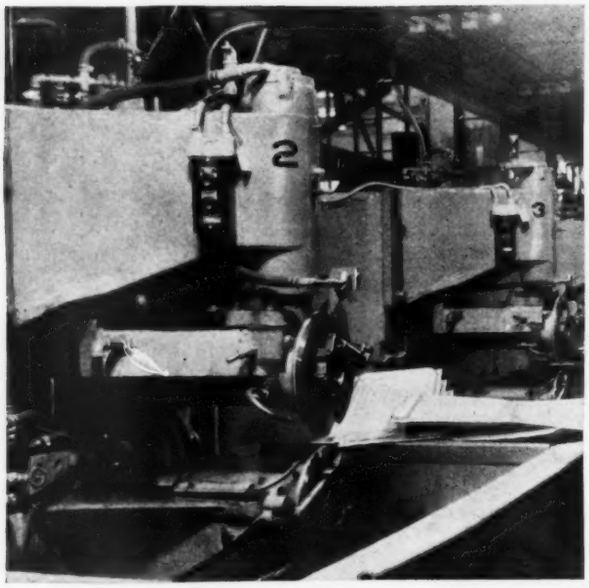
In butt- and flash-welding machines one of the clamps is usually rigidly mounted on the base, while the other slides on a platen under action of a pressure device. On the smaller machines the pressure is produced by a hand lever or by heavy springs, but on welders of any considerable capacity it is produced by a hydraulic or pneumatic ram so that pressures of 1,500 to 2,000 lb. per square inch may be applied to the joints.

Butt welding is employed for copper and aluminum wire, flat copper and brass stock, steel wire, rods and flat stock and wrought-iron piping. Flash welders are used for a wide range of production processes, such as fabrication of wagon tires, axles and spokes, bicycle crank hangers, seat posts, fork ends, braces and brake parts, automobile rims, connecting rods, transmission shafts and step brackets. Flash welding is also used extensively in tool manufacture for uniting cutting steel heads to low-carbon steel shanks and bodies. Fabrication of wire fencing, wire mesh and forms is also a function of a flash welder. Both butt and flash welding may be used to unite iron, steel, copper, brass and aluminum.

*Spot Welding*—Spot welding is employed for welding together such pieces as were formerly united by bolting or riveting. The pieces to be joined are placed in the position they are permanently to occupy and two points, or dies, are brought into contact with them, one above and one below the point of union. Sufficient current is then passed through the circuit to fuse the metal at the point of contact. Application of heavy pressure completes the weld or spot. Spot welding raises no bulge at the point of union. On the contrary, there is a tendency to produce a small depression which may be avoided by heavy currents and short timing of the current. Since heating starts at the inner sides of the two pieces, short timing does not allow sufficient heat to penetrate the outer surfaces and soften them, thus preventing the dies from making a dent. This method is classed as shot welding.

Heat, pressure and timing of the current must all be accurately co-ordinated for a satisfactory spot weld. The size and material of the dies affect their working life. If the dies are too large they will last longer, but the heat will be dissipated over too large an area and will likely produce an unsatisfactory weld. Small points concentrate the heat more accurately, but require frequent dressing to maintain satisfactory condition. The life of the die points can be greatly increased by water cooling.

In spot welding the pressure is ap-



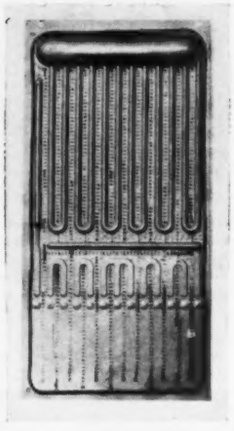
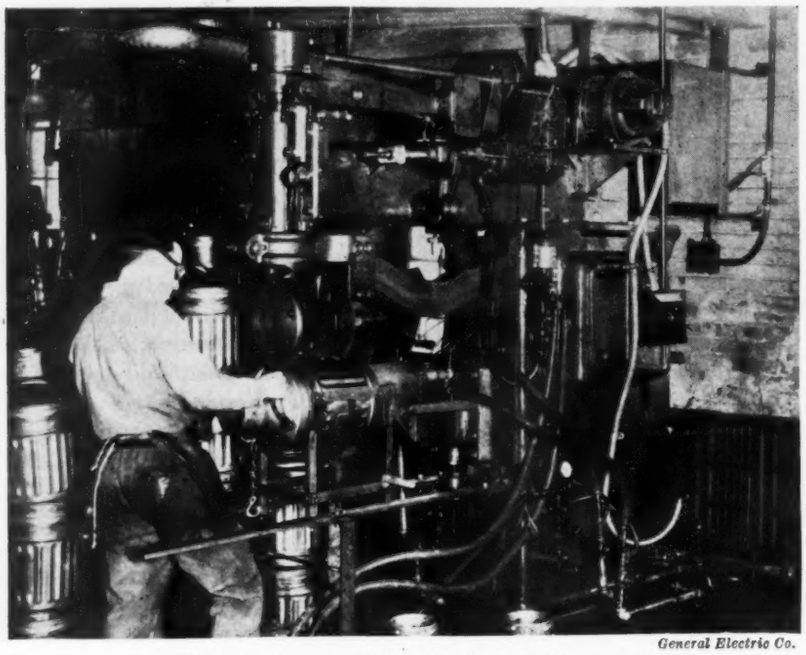


**Fig. 6a and b—Seam welders for fabrication of refrigerator evaporators**

*General Electric Co.*

At the right is shown one of the evaporators with its pressure-tight seam welds, intermittent seam welds and spot welds. Notch in welding disks permits welding to start very close to raised rim of evaporator. Outer edges joined by pressure-tight seam weld, while union between flutes requires only closely spaced spot welds.



*General Electric Co.*

**Fig. 7—Seam-welding heads to milk cans**

When can is placed over dies, foot lever is pressed, putting into action electronic tube control, which is contained in steel cabinet at side. This control automatically regulates spacing and timing of welds for liquid-tight joint.

plied first, thus clamping the pieces firmly together before the current is established. The current is cut off before pressure is released so that there will be no arcing on the points of the dies when they are raised. To co-ordinate the pressure and timing of the current both mechanical and electrical devices are employed. With mechanical control a cam is used in connection with the pressure roller so that current can flow only after the roller has effected contact of the dies and is broken before the dies are raised. By the use of a synchronous motor very exact timing from one-half cycle up is obtained and, once adjusted, the performance of the welder will be uniform for any given thickness and kind of material.

With electrical control the current is regulated by electronic tubes, commercially known as thyratrons or ignitrons, which may be adjusted to pass current for a predetermined number of cycles. Having no moving parts, long life and uniformity of results are obtained. However, compared with mechanical control, the first cost is relatively high. Replacement of tubes, which have an average working life of about 10,000 hours, is generally far less expensive than the replacement and reconditioning of the working parts of a mechanical control.

Pressure for holding the parts in contact may, in the smaller machines, be applied by a hand lever, while in the larger sizes a cam roller or pneumatic ram is generally employed, since spot welding pressures often range from 15,000 to 100,000 lb. per square inch of die point area, depending upon the thickness and nature of the stock being welded.

*Multiple Spot Welding*—For the welding of automobile bodies on a large scale, a multiple spot welding machine has been developed which is capable of operating at a high speed and with great accuracy. The various parts forming the cowl, windshield or other portions of the body are placed in a jig which holds them in contact in their correct relative positions. Built into the jig are a number of hydraulically operated welding guns which, when ready for operation, successively close their jaws upon the spots for which they are intended, pass the welding current and complete the weld. As their operation is entirely automatic a complete cowl may be assembled or a windshield fabricated in an extremely short time. As a specific illustration, the nine parts forming the cowl of a well-known make of car are welded in such a machine within less than one minute. In this short period 160 welding guns are automatically set and withdrawn; little additional time is required for removing the completed cowl and inserting the parts for the next. Similar use of these automatic welders, known as hydromatic welding machines, is made in the fabrication of refrigerator chambers and other parts which are produced in large quantities.

*Portable Spot Welders*—In one form the transformer and control are contained in a casing from which air pressure lines and electric leads run to the welder itself, which is built in the form of a yoke. One jaw of this yoke holds the fixed die, while the other die is controlled by an air cylinder so that pressure may be applied after the yoke is placed in position. Portable welders are especially suited to marine and construction work, such as welding heavy roof or deck sheets to trusses or cross members.

Such welders are also made in small sizes for a variety of production operations in which the work is held in jigs and the welder moved from point to point. In this smaller type, known as the gun welder, the points, or dies, are brought into contact over the spot to be welded and an air cylinder forces the movable die into position and applies the pressure. When the pressure has reached a predetermined point the current is automatically switched on and broken at the completion of the weld. Since spot welding with this type of gun requires from one-twentieth to one-third of a second to produce a weld very rapid work can be done. The gun welder is used largely in automobile construction for uniting body sections and other parts in continuous production.

Another modification of the portable machine is the stud welder, employed for attaching studs to steel walls or on steel surfaces for the support of pipe and fittings. In use, a stud is inserted in the gun, which is then placed in contact with the surface to which the stud is to be welded. Spring pressure holds the stud against the work. When a trigger is pressed a heavy current flows through the stud to the metal surface and back through the gun for a sufficient time to complete the weld. The current is automatically cut off at the proper time regardless of how long the trigger is pressed.

*Projection Welding*—The spot welder is essentially a single operation machine in that a single weld is made at a time, although two or more sets of dies are in some cases used for duplex or triplex spot welders. With projection welding, on the other hand, a number of welds are made by a single operation. One of the two pieces to be united is first provided, by punching, with a number of projections (Fig. 1). In the welding machine two heavy metal blocks are used in place of the conical dies of the spot welder. When current is established through these blocks under pressure fusion and welding take place at each point of contact.

As this process requires the preliminary preparation of the projections on the pieces to be welded it is generally employed only where the quantity of production warrants the expense of such preparation. This type of welding has proved of great value in automobile manufacturing—one of the largest fields for its employment. Wheel hubs, rims, shoe reinforcements and similar parts of the car are fabricated by a single operation of the projection welder, producing from three to ten or more simultaneous welds at a rate of several hundred pieces per hour.

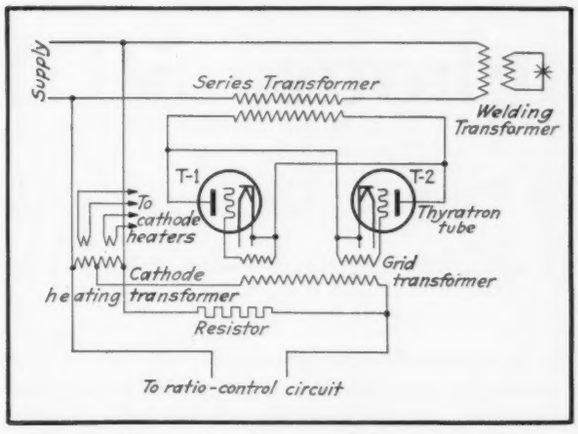
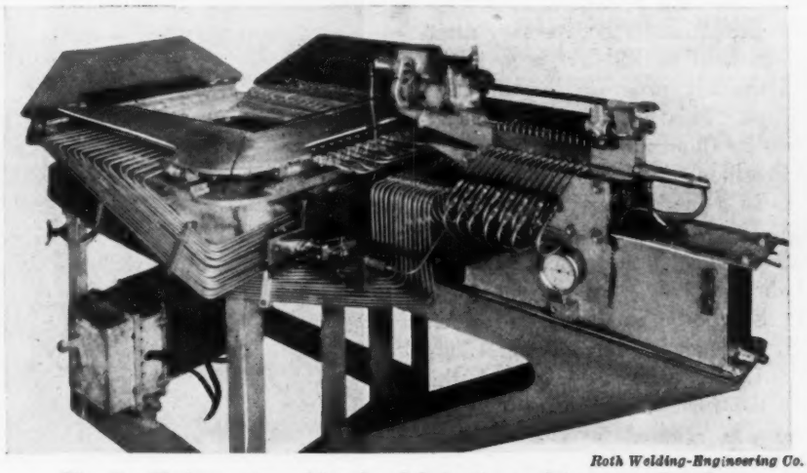



**Fig. 8—Electronic tube control for seam welder**

When either of the tubes, *T-1* or *T-2* is conducting current the secondary winding of the series transformer is practically short circuited and the impedance of its primary winding is very low so that practically full-load current is allowed to pass through the primary winding of the welding transformer. When neither of the tubes is conducting current only the exciting current flows through the series winding so the welding transformer is virtually cut off. Thus the tubes act as a control without the intervention of any mechanical parts. The ratio of the secondary to the primary winding of the series transformer is made very large so that the tube current is comparatively small.

In addition to the power circuit illustrated, there are two auxiliary tube circuits—the ratio-control and the timing circuits. The former, containing two small thyratron tubes, can be adjusted by a variable resistor to obtain the desired relation between the "on" and "off" periods. The timing circuit employs a single thyratron tube which conducts at regular intervals, the length of which determines the time of the total welding cycle. The intervals can be adjusted in steps of one cycle by a variable resistor. The control may be adjusted from one cycle on and one cycle off, to ninety-seven cycles on and seven cycles off, to obtain the spacing and length of the successive spots best suited to the class of work being welded.



*Roth Welding-Engineering Co.*

**Fig. 9—Hydromatic welder for fabricating refrigerator chambers**

The parts of the chamber are assembled in the rectangular opening at the left. The spot welds for attaching the base to the frame are automatically made by the successive operation of the spot guns to which the tubes are attached.

*Seam Welding*—Seam, also called line or stitch, welding is what might be called a continuous application of spot welding. The dies take the form of a pair of rollers, or disks, between which the pieces are passed, under pressure, while current is flowing intermittently through them. Early experience with seam welding showed that if the current was allowed to flow continuously too widespread heating of the plates being welded would occur, resulting in irregular or imperfect seams. Successful results are, however, obtained if the current is allowed to flow long enough to form a single spot weld, then interrupted until the plates have moved a fixed distance and the process repeated. This results in a series or chain of spot welds giving a continuous weld the entire length of the joint that is being formed in the operation.

The spots may be placed at suitable intervals to form a mechanically strong union of the pieces or they may be placed so closely that they will practically overlap and thus form an air- or steam-tight joint. Such regulation of the spacing, requiring a very closely governed relation between the "on" and "off" periods, together with the timing of the current for each spot, requires most accurate control, which,

[*Continued on page 78*]

# Westinghouse 50 Years Old

## Holds Family Party for Employees—Address by Robertson Recounts Its Achievements—Urges Holding to Past Ideals

IN CELEBRATION of its Golden Anniversary year, 1936, the Westinghouse Electric & Manufacturing Company gathered employees together on January 8 in meetings held simultaneously at every place in which it is represented by factories, offices, warehouses, subsidiaries or dealers. This date is exactly 50 years from January 8, 1886, when the company was granted its charter for the "manufacture of electrical products."

The headquarters anniversary meeting was held in Pittsburgh and provided the key program for all other meetings. This program included addresses by Chairman A. W. Robertson and President F. A. Merrick and other events in a family party. Short-wave radio communication was used to link together the celebration in this country and abroad.

At the Pittsburgh meeting President F. A. Merrick, in introducing Chairman A. W. Robertson, stated that while the formal charter of Westinghouse was granted 50 years ago by Pennsylvania, "the real charter under which Westinghouse Electric was founded is the spirit of progressiveness, courage, integrity and humanity, under which it has forged ahead to its eminent position of service in our modern life.

"Mr. Robertson personifies in these modern surroundings the spirit of progressiveness, courage, integrity and humanity, and Westinghouse, under his proved leadership, goes happily and confidently forward to meet the problems of the ever-expanding new frontiers in the electrical industry."

Mr. Robertson's address follows:

"The Westinghouse Electric & Manufacturing Company started life January 8, 1886, a short generation after the Civil War, and celebrates its fiftieth birthday almost a generation after the World War. It has survived booms and depressions. From a simple beginning in a little shop in Garrison Alley, Pittsburgh, Pa., it has grown as the country has grown, until today its activities are world-wide. In its pioneering day under the aggressive leadership of George Westinghouse, its founder, it fought great battles upon the wide plains of science. The present universal use of alternating electric current is due in no small measure to the prophetic vision of

A. W. Robertson

George Westinghouse. It took courage to oppose the great Edison, but Mr. Westinghouse was not lacking in courage. The Westinghouse organization has never lost the spirit of courage, enthusiasm and foresight instilled into it from the day of its birth by its founder. These traits are basic elements in the character of the institution. No one could visualize a Westinghouse organization without them.

"The Westinghouse company has taken an important part in many heroic business ventures. It undertook to harness Niagara Falls and did it. From the vantage point of today this may seem a simple thing, but when it was done in 1895 it was a most daring and remarkable thing to do. The Westinghouse company built the first steam turbine in America, destined to revolutionize the steam power of the world. Year by year it has added new devices to make electric power more readily available for daily use. Electric current would not be the universal servant of man except for the contributions which Westinghouse has made to the art of manufacturing, distributing and controlling it.

"More recent examples of courage, enthusiasm and foresight are not lacking. Only last year the Westinghouse company contributed the Diesel engines, generators and motors to drive the streamlined train, *Comet*, at more than 100 miles an hour if desired. Westinghouse made the larger number of the giant electric locomotives of the Pennsylvania Railroad running on the New York to Washington section. The giant water gates of Boulder Dam were made by Westinghouse. Westinghouse new surge-proof transformers successfully challenge the lightning. Examples need not be multiplied.

"The Westinghouse company has contributed equipment which has brought conveniences and comforts to millions of men and women. My mother made her own candles for light. She cleaned her floors with a broom. She pumped water from a well and carried it into the kitchen. She had no bathroom. She had no refrigerator. Her fuel was wood and thermostatic control of heat was unknown. Hot water was a luxury. The house in which she lived her life is still my home. Its rooms are now bright with electric light from Westinghouse bulbs; a vacuum cleaner made by Westinghouse keeps the floors clean. An automatic, electrically operated pump supplies water not only to the kitchen but to a bathroom, and both hot and cold water are always available. An electric refrigerator keeps food fresh. If my mother could come back to live her life over again in this new old home I honestly believe she would prefer it next to Heaven. All these changes have taken place during the past 50 years.

"The Westinghouse Electric & Manufacturing Company has contributed not only directly to the welfare of the housewife in the millions of homes in America and elsewhere with household appliances of the highest quality, but has been largely instrumental in making, distributing and controlling electric current from the turbines and generators in the power plants through the transformers, switches, meters, etc., to the electric switch in the wall of our homes.

"Literally billions of passengers have been carried up and down the streets of cities on street cars driven by Westinghouse electric motors. Before the day of the automobile this was a priceless boon to humanity. It is difficult for us to realize that before the street car it was customary for workers to walk long distances to and from their work. The cars of the modern subway of today, with its high-speed trains, are driven by Westinghouse motors. The very fact that we sometimes complain about their overcrowding is the best evidence that they are a most popular convenience.

"Westinghouse equipment has contributed tremendously to the modern efficiency of industrial plants throughout the country, and these industrial plants, in turn, have made modern luxuries cheap. For instance, the great steel mills now make sheet steel so cheaply that we can have all-steel automobile bodies, steel refrigerators, etc. These economies have aided the widespread distribution of modern luxuries and conveniences. Many persons think of an efficient machine as something that will throw people out of work. Nothing could be farther from the truth. Efficient machines, to be sure, enable more articles to be made with less labor and at less cost, but the reduction in the price of the thing so made increases the market for the product so that more articles are made and actually more labor is used, both in increasing the number of units and in the servicing of the units and in connection with their use.

"One example will illustrate what we have in mind: The modern automobile, which is made with a minimum of hand labor, is sold at a price which has greatly stimulated the number of automobiles bought and used. This has brought prosperity, with correspondingly increased employment, to oil companies, cement companies, road-building companies, filling stations, garage and repair shops, hot-dog stands, roadside eating places, tourist camps, and so forth, the benefits reaching down to almost the humblest home in the remotest hamlet. It would be almost literally true to say that millions of people were given employment in America because Westinghouse motors and electric controls were built to operate steel mills so efficiently that sheet steel for automobile bodies and steel for other uses is made very cheaply. The price of small motors made by the Westinghouse company and used to operate washing machines, for instance, has been reduced during the past fifteen years more than 70 per cent. As a result, the price of these modern conveniences has been greatly reduced, more sold and more people employed otherwise.

F. A. Merrick

"Westinghouse developed the radio. It erected the first commercial broadcasting station, KDKA, at Pittsburgh, and this station is sending out my voice tonight over the short-wave division W8XK.

"The Westinghouse company has developed and erected the highest speed commercial passenger elevators in the world. It furnishes hundreds of things that the world uses. They vary in kind and value. We recently took an order for 6,000,000 Mickey Mouse cereal bowls. We also recently built and installed the largest single-shaft electric turbine-generator, having a capacity of 183,333 kva., in the Philadelphia Electric Company's power plant. We make 40,000 standard styles of electric motors and thousands more for customers' special requirements. We manufacture all kinds of household appliances and every kind of electric transformer, switch control or other device for the handling of electric current.

"All of these devices and all of our activities have to be planned intelligently, oftentimes as experiments. But if we sell an experiment to a customer it must be a success, otherwise that customer buys no more experiments from us. In other words, we must have sufficient foresight to make certain our experiments are successful.

"The Westinghouse organization accomplishes in its entirety what no one single member of the organization could do alone. The organization is so skilled in self-discipline that it might almost be thought of as a living entity which has the intelligence and the ability to perform over and above the capacity and intelligence of the individual members. In other words, long years of application of courage, enthusiasm and foresight, which are a basic part of our institution, have given the institution itself a certain knowledge and ability which, while intangible, is of almost priceless value. It cannot be taken from it, no one can copy it and it will exist as long as the institution itself continues to be a vigorous, live organization.

"The Westinghouse company organization might be said to be 37,000 man and woman power strong. At the present time it has 2,000 engineers and 3,600 salesmen. Its gross business in 1935 was approximately $121,000,000. It has a payroll of $5,000,000 per month. Fifty thousand stockholders own the company. There are no bondholders. The company has no debts.

"The Westinghouse company has always been progressive in employee welfare. Pensions, welfare and educational activities have always been found in the Westinghouse organization. Westinghouse is justly proud of the fact that its standards of wages, sanitation, safety, etc., are above the requirements of the law. As a result, labor turnover is low. Misunderstandings between groups of employees are few. The results of operations have been satisfactory over the years. During good times substantial profits have been earned and dividends paid to stockholders. During times of depression the reserves of the company have been ample to make some return to the stockholders and to

[*Continued on page 64*]

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## *A Sermon for Sales Managers*

FOOD for much meditation lies in three statistical comparisons in our last issue. Energy output by the power industry in 1934 aggregated 93,575,000,000 kw.-hr. The year before it had been 85,970,000,000 kw.-hr. The increase was about 9 per cent. But the total revenue from this vast business was $1,923,500,000 last year, as against $1,837,046,000 in 1934. The increase here was under 5 per cent. The reason was that many rate reductions went into effect. The tax bill increased from $246,300,000 to $260,000,000, and other operating expenses, excluding overhead, mounted from $857,200,000 to $905,100,000, cutting the increase in net to 3 per cent. There is a whole sermon for sales managers in these figures.

The message is a simple one. In a few words, with costs going up and rates coming down, a 10 per cent annual increase in sales is no longer adequate for this period in this business. It may look well on a chart, but under present conditions in the industry the output curve must climb faster than that, if net earnings are to be either satisfactory or safe. Tradition and precedent are out the window. Times have changed. A new rate of volume growth is called for. And the new demands must be met, no matter how excessive they may seem.

It is naturally hard for men to reorient themselves to such radical changes. It has always been a principle among utilities that rates should be reduced as volume increases, but now that principle gives way to a policy that prices must be cut to attract more volume, which is just what every other business does. Again, there has been a tradition that nearly half the domestic consumers of any urban company must be carried at no profit. But this, too, is incompatible with present needs, and ways are being found in some cities to load up these minimum bill accounts with lighting and small refrigerators, for example. And new methods are evolving also for building up commercial and industrial consumption by assisting present customers in productive modernization.

The answer to this whole problem of increasing sales and rebuilding revenues on the new lower rate plane is primarily a matter of the attitude of management. The urgent need cannot be avoided. It is a question of what to do—and that is clear. Money and man-power will create this greater volume now so essential. With money and man-power provided, methods can be developed that will make the investment and the operation profitable. But there is no substitute for man-power and money.

The record of income growth for any company in the next few years is going to indicate pretty definitely the measure of the courage of its management. Where commercial policies are adjusted to the new conditions, better selling will be done. Where more money is spent to create a greater market by better selling, more money will be made.

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## *Co-ordinate Neighboring Utility Facilities*

THERE is, strictly speaking, no special time for co-ordination of facilities of neighboring utility groups. The proper time is *all the time*, and by and large the utilities of this country have done a magnificent job in that work of co-ordination. In every phase of activity—in planning of generation and transmission facilities; in exchange of power—firm, economy and dump hydro; in pooling of reserve capacity; in frequency and time regulation—in fact, in all the broad problems of interconnected and integrated system operation the utilities of the United States have done pioneering work and have been maintaining world leadership.

But here and there gaps have undoubtedly been left. In some cases actual physical gaps exist that additional transmission lines can bridge. In still others merely new switching facilities will bring about physical interconnection, while in many cases actual physical interconnection has already been accomplished and determination to make fuller use of these combined facilities is needed to make possible large savings and improvement in service. During the long depression period of declining loads there frequently did not exist sufficient incentive to complete some of these steps.

Happily that period is past. Load is climbing. With new highs in power output there is a pressing need for capacity—if not for firm capacity, then at least for standby or for operating reserve. All of this should give economic stimulus to a re-examination of all the situations where co-ordination of systems and facilities has not been developed to the fullest. Such an examination, it is confidently believed, will not only reveal

ways and means of making savings in supplying the very rapidly increasing loads of the groups joining in co-ordination, but, in addition, will have another great advantage. By closing of substantially all the interconnection gaps that can be justified now there will be removed from those governmental groups who are surveying such situations the temptation to claim as their accomplishment any such interconnection and co-ordination as may be brought about. Perhaps that danger is very small. But, keeping in mind the persuasiveness of the facile and specious *post hoc ergo propter hoc* method of reasoning, why should any chances be taken? With loads at their present levels and showing prospect of continuing to grow during the next year, the logic is inescapable that now is the time for the fullest co-ordination of neighboring utility systems.

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## *Popularizing Mergers*

UTILITY system mergers are again coming into the power industry picture, at least on a modest scale. The demand for simplification of corporate structures presses, and rising costs put a premium upon operating economy. It is important to have public opinion favorable to well-considered consolidations, because if sentiment is hostile or uninformed regarding particular mergers, good will may be lost and valuable savings delayed to the detriment of the public itself. Rates cannot be reduced as rapidly where costs are excessive as under more efficient administration of systems, and sound financing of plant expansion is more easily achieved where a regional set-up accords with the principles of legitimate centralization.

Power company men see the advantages of economically justified mergers very quickly when the facts are before them, but the public does not "check" such conclusions as promptly. In a recent consolidation of two operating properties in the East, serving perhaps 15,000 customers all told in a rather thinly settled area, considerable opposition to the merger developed at the commission hearing which preceded the board's approval of the union. Town officials and citizens feared that the more prosperous company would have to "carry the bag" for the less successful one; objections were raised to giving rural customers town rates; apprehension was voiced over the size of the unified system to be, and the future of the rate schedules of each property caused anxiety. The point was made that had the utilities explained the situation as thoroughly as possible locally before the state board hearings began misunderstandings would have been minimized and many months saved in putting the benefits of the merger into effect.

In this case the utility representatives doubtless felt that the situation was so clear that a hearing at the state Capitol would suffice. It was believed that public hearings in the towns concerned would leave many citizens unenlightened on account of the technical aspects of the merger problem, and that the state commission's grasp of the situation would meet all of the requirements for public understanding.

As the hearing developed before the board, it became apparent that the lump of misunderstanding would have been greatly leavened by more effective local proceedings. Many of the advantages of the merger could have been clarified in advance; the fact that no increase in rates on either property was contemplated or feasible would have been emphasized, and the benefits of unified operation would have been stressed. Opportunity to question executives would have borne fruit in better comprehension of merger objectives by public officials and leading citizens. Such methods deserve favorable consideration in seeking that good will which flows inevitably from co-operative administrative foresight.

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## *Congratulations to Westinghouse*

ON JANUARY 8 the Westinghouse Electric & Manufacturing Company celebrated its golden anniversary year by holding family parties of employees in all parts of the world. This company, incorporated on January 8, 1886, to "manufacture electrical products," began operations the following March in a small factory in downtown Pittsburgh. Fifty years later it has nineteen plants, a normal group of 40,000 employees and a gross normal sales of about $180,000,000 per year, with representation in more than 80 countries.

In its infancy the company listed thirteen products for sale and now its catalogues contain hundreds of thousands of items. It makes a complete line for power production, for manufacture and for service. It has grown with and for the industry. Its history is a quick index of the electrical era.

From the start the Westinghouse institution was characterized by two things—the technical development of products and commercial daring in the exploitation of these products. The technical genius of Stanley and the commercial acumen of George Westinghouse forced the commercial success of the a.c. system. A similar daring combination of technical skill and business judgment lay back of the lighting of the Chicago Fair in 1893, the development of the polyphase motor and the harnessing of Niagara Falls to electrical machines many times larger than any built previously—just to select a few beacons of progress.

Pioneering policies of the early days have been maintained and have made possible many notable contributions to the industry and the art. ELECTRICAL WORLD and the industry gladly join in the heartiest congratulations and best wishes for this outstanding enterprise and its thousands of workers.

# Utilities in Court and Congress

BELIEF that the public utility holding companies, now under death sentence, may get a chance to survive, if they will promise to be very good indeed, is increasing among constitutional lawyers. They do not contend that there is any very close analogy between the constitutional principles involved in the A.A.A. case and those underlying the Public Utility Holding Company Law. In fact, there is a much closer analogy between the NRA law and that affecting the utilities, so that actually Messrs. Cohen, Landis and Cochran had the advantage of that opinion *before* the final compromise on the holding company legislation was reached.

Lawyers will not talk right out loud about it, but the factor which has increased the probability—in their minds—for an unfavorable opinion in the holding company case is something not contained in legal textbooks. It has to do with human tendencies on the part of the nine Justices. Mr. Dooley once intimated that the Supreme Court was not entirely ignorant of election returns. There have been no election returns of importance recently, but there are varied and sundry indications that the country as a whole is all over its first blush of enthusiasm for the New Deal. It is shown in the *Literary Digest* poll, in half a dozen other polls of various sorts being taken by thoroughly disinterested agencies. It is even more manifest in the frame of mind of the Senators and Representatives who have come back from their constituencies for the present session.

Moreover, lawyers point out, there is no such crisis apparent at the moment as seemed to be when the high court, for instance, decided five to four that the devaluation of the dollar was within the rights of the federal government.

AGAIN, lawyers point out, the court unanimously rejected the NRA. It just so happened that business had already started on the up-grade. Hence there was no general wage cutting and hour lengthening. In short, there was no impressive grinding down of those whom NRA was designed to protect as a result of the removal of that protection. Hence there was—to New Dealers—a lamentable lack of clamor against the court and its decision. In fact, as will be well remembered, President Roosevelt did not follow up his talk, immediately after that decision, which seemed to promise a fight to revise the Constitution, or at least to prune the powers of the court.

All of which, observers here insist, affects the psychology of the Justices whether they are conscious of it or not. Especially on questions of such delicate balance that one's colleagues differ violently and resort to writing minority opinions, it is very satisfying to become convinced that the people of the country as a whole are not enraged at the decision. To put it mildly, it removes the element of the pressure of public opinion, which might easily be tending at the moment to push the Justices in the direction of compliance with New Deal objectives.

The next question is, what will happen *if* the Supreme Court should hold the public utility holding company act unconstitutional?

Naturally the answer depends on just how sweeping the opinion of the high court might be, but the strong probability, as viewed by lawyers here, is that plenty of latitude would remain in the hands of the federal government. No one believes there *could* be an opinion which would be anything like as sweeping, for example, as the A.A.A. case. Which would leave the situation that President Roosevelt would undertake to force through a substitute measure. With that in view, and leaving out all thought as to further limitations which the court decision might impose, the prospect narrows down to what Congress would be willing to do.

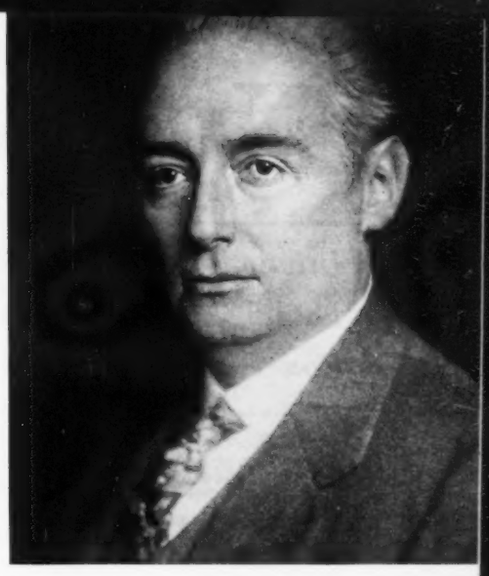
THIS writer believes Congress would enact something very closely following the lines of the plan suggested by Wendell L. Willkie, president of the Commonwealth & Southern Corporation. He believes further that no matter to what lengths of pressure President Roosevelt might resort, he would not be able to get much more.

The reasons for this opinion depart again from any question of law, and enter the realm of pure politics. In the first place every member of the House comes up for re-election this fall. So do one-third of the Senators. One hundred Democratic members of the House are sitting in seats from districts normally strongly Republican. One hundred more are sitting from districts which are normally very close. One year ago, shortly after the Democratic landslide of 1934, those 200-odd members would naturally figure that the country was tremendously behind Roosevelt, and that their best chance for surviving would be for Roosevelt to be elected so overwhelmingly that he would pull them through as the tail of his kite on election day.

That attitude has passed. Most politicians today believe the election next November may be fairly close. They expect Roosevelt to run very poorly in certain well-defined sections—for instance, New England and New Jersey. Even in the states which he will carry, outside the South, they expect his margin to be fairly narrow. Bear in mind that it is not so important in this connection what the facts are, or what the facts will be on election day. It is what politicians and Congressmen *think now* that is important in affecting votes in the next few months—until there has been something to change their opinions as to political prospects.

HENCE many a Congressman who a year ago followed Roosevelt unquestioningly on most controversial questions today, and next month, will be asking himself: What would help me most to win re-election? Roosevelt's pleading will be unimportant compared to a militant minority, much less a majority, opposing that plea. This campaign, in short, promises to be every man for himself.

It is very important in weighing these considerations, however, to remember that during the last few years a



# —By CARTER FIELD

**This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him.**

great deal of political capital has been made by politicians by attacking the public utilities—particularly the electric companies. The President has had a very wide hearing for all his attacks on the abuses of and objections to holding companies.

AS a result of the amazing letter-writing campaign of utility stockholders last session, when they were fighting to kill the death sentence, it was pretty well borne in on many national legislators that the "interests" were not confined to Wall Street, but were represented in rather surprising numbers right in their own districts. They have not forgotten that. But they are also convinced that there is very strong public sentiment for drastic reforms in the utility holding company situation.

Hence the probability of the Willkie compromise, at least in part. On one feature—that which would prevent the government from competing—there may be a Supreme Court decision clarifying the situation. For it is entirely possible that the high court may outlaw T.V.A. If the court should uphold T.V.A. in unlimited sales of electricity, it is not probable that Congress would be willing to guarantee the utilities against government competition. In fact, it is almost a certainty that it would not.

In their private conversations most Senators and Representatives think the most important step to be taken in regulating the holding companies is to prevent unfair charges on the operating companies for management or any kind of service. In short, the objective is to protect the ultimate consumers from high charges. Had there been no White House whip and spur the death sentence would never have got to first base in the last session.

EVEN the railroad holding company law has never been passed on by the Supreme Court. So actually there is less straight-out precedent than most people suppose.

George W. Norris keeps marching on his drive toward what he hopes will be the ultimate—government ownership and operation of all utilities. In his new Mississippi Authority bill he blandly gives the proposed new agency complete control over every part of the Father of Waters and all its tributaries—except the Ohio.

The Ohio, Uncle George turns over to T.V.A., a proposal which he did not even bother to mention to his friends on Capitol Hill, and which consequently escaped notice save by those who read the actual text of his bill.

No one would bother very much about if it had been introduced by anybody else, but Mr. Norris, as Senator Lodge once remarked, is a very stubborn man, and in late years has been getting his way in what had appeared to be hopeless fights time after time.

Incidentally, the Nebraskan takes due notice of the contention of the government lawyers in seeking to maintain the constitutionality of T.V.A. The title of his bill reads: "To provide for the control of flood waters in the Mississippi Valley, to improve navigation on the Mississippi River and its tributaries, to provide for the irrigation of arid and semi-arid lands, and for other purposes."

"Other purposes," of course, is the generation and sale of electricity. Friends of the Senator lay stress, as doubtless lawyers will later, if it should become law, on the bill's own statement that the "maximum generation of electric power" provided for is modified by the clause "consistent with irrigation, flood control and navigation."

ANOTHER friendly little gesture of Norris toward the utilities has less chance of approval. This would loan $100,000,000 of government money every year for nine years to publicly owned and co-operative rural electrification projects. Private projects would be barred.

President Roosevelt is not particularly enthused about this. He has recently been distressed over Morris Cooke's R.E.A., which has been finding it very difficult to line up sound, self-liquidating projects not backed by the privately owned utilities. All of which was very disappointing to the White House. The actual batting average on a dollar basis for the kind of loans to public ownership type utilities Roosevelt envisioned is about 3 per cent. To put it another way, Mr. Cooke has only been able to dig up 3 per cent as many public ownership electric projects as Mr. Roosevelt, last March, told him he could have money for!

So Norris' proposal of another $100,000,000 a year for the next nine years would seem to be carrying coals to Newcastle.

Meanwhile some of the New Dealers are worrying about the loyalty of Governor Brann of Maine. Right at a low period, so far as popularity is concerned, for Passamaquoddy is letting workers go now for the slack winter season, what with housing completed, etc., Brann promises consideration for state authorization of the project at the next *regular* session of the Maine Legislature. *No special session!*

Half as much suspicion as this has generated in Washington against Brann would have resulted in any Chicago gangster being taken for a ride!

The rapid government ownership men figure Brann is counting on the Supreme Court curbing federal powers

(*Continued on page 80*)

# NEWS OF THE WEEK

***Injunctions swamp P.W.A. power loan plans . . . Government lawyers seek to block the holding company law test . . . Utility financing jam broken as S.E.C. permits West Penn Power issue . . . Short circuit and fire in Hell Gate station darken New York for 3 hours***

## Injunctions Swamp P.W.A. Loan Plans

**Utilities secure thirteen restraining orders — Newton D. Baker represents Duke Power in government's appeal from writ blocking Buzzard's Roost**

Litigation concerning P.W.A. loans for power projects to compete with existing private facilities—a phase of federal activities regarded by many as the most serious present threat to the utility industry—is rapidly pushing closer to its ultimate determination; the immediate news is another wholesale batch of injunctions against the governmental loan agency.

These restraining orders, preliminary in form, were granted in thirteen of the suits pending in the District of Columbia Supreme Court. Previously these writs had been of the limited ten-day character, the court now taking action to eliminate continual extensions.

*Carolina case argued*

At the same time the Buzzard's Roost case moved a step nearer the United States Supreme Court when arguments were heard before Judges John J. Parker, Elliott Northcutt and Morris A. Soper in the fourth circuit federal Court of Appeals, the galaxy of legal talent on both sides emphasizing the importance of the test.

Chief of counsel for Duke Power Company—successful so far in its opposition to the Buzzard's Roost project—was Newton D. Baker, while Jerome N. Frank and Alexander Holtzoff, assistant to Attorney-General Homer S. Cummings, appeared for the government. Argument centered around whether the project actually was receiving a 70 per cent loan plus a 30 per cent gift or whether the full amount would be repaid; whether Secretary Harold L. Ickes' P.W.A. aid is intended to force lower rates on power companies now supplying electrical service; whether federal rate regulation of such a sort, if it actually is contemplated, is not usurpation of state rights, and whether the whole matter was not decided in the A.A.A. decision denying the government the right to make loans for regulation and/or coercion.

This case, in which the loan and grant was enjoined in United States District Court, is the first against P.W.A.'s revised contract form to reach the appellate court (ELECTRICAL WORLD, page 104, January 4).

Another important P.W.A. challenge also remains in the limelight, Carolina Power & Light's suit against the $36,000,000 Santee-Cooper project having moved into District of Columbia Supreme Court, where a temporary restraining order has been granted. One of the allegations is that $9,000,000 of the federal money is an outright gift. This case also is pending in the Carolina courts.

Despite these suits, Col. William G. Caples, federal engineer, was in Columbia, S. C., a few days ago for a "routine inspection" of the Santee-Cooper development. At the same time his assistant, Captain Fred T. Bass, and Artemas L. Brunson of St. Matthews, S. C., were investigating another possible dam site.

And Sandusky, Ohio, which had a P.W.A. loan approved only to see it enjoined by Ohio Public Service Company, retaliated by voting, in the City Commission, to issue $1,100,000 in bonds for a municipal light plant in case the federal grant is not received.

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## Rhode Island Plans Municipal Plants

Gov. Theodore F. Green of Rhode Island has recommended to the incoming Legislature that steps be taken to allow for the first time cities and towns to generate and distribute electricity in the same manner as private companies and under the same state regulation. A popular referendum would be required by bills introduced in harmony with the Governor's message before such systems could be owned and operated. Provision has been made in pending bills for joint operation of municipal systems as single enterprises under a group authority. The right of eminent domain is also specified.

The Governor also urged a state survey of rates by the utilities division, to be financed by special appropriation.

## U. S. Seeks Delay in Utility Test Case

**Government lawyers question jurisdiction of Circuit Court, seeking to clear way for their own test — Davis calls holding company law "vicious"**

The means by which government lawyers will attempt to keep the American States Public Service test of the Public Utility Act of 1935 from being the first such case before the United States Supreme Court became apparent in Charlotte, N. C., early this week when these attorneys questioned the jurisdiction of the fourth circuit federal Court of Appeals. The case is the appeal by Burco, Inc., a bondholder, from federal District Court Judge William C. Coleman's "unconstitutional in its entirety" decision in Baltimore on November 7.

*Industry watches test*

Utility leaders have openly expressed the hope that this case can be pushed up into the Supreme Court, declaring that they see no hope of getting their own tests advanced against government tactics and implying that they will do all in their power to prevent federal attorneys from testing the act on their hand-picked Electric Bond & Share suit. If the American States Public Service case is blocked it is freely predicted that constitutionality of the "death sentence" measure will not be settled for a year or eighteen months due to this conflict of legal strategy.

Although the federal lawyers appeared in Charlotte only in the familiar rôle of "friends of the court," they at once served notice that their plan is to clear the tracks for the Bond & Share suit by seeking legal delays in the pending action. Their first reward, however, was a rebuke when John J. Burns, S.E.C. counsel, criticised Judge Coleman for lecturing on the Constitution. Judge Burns withdrew his remarks when censured by the Court.

Again taking the most prominent position in the hearing was John W. Davis, appearing for Ferd Lautenbach, interceding creditor who challenges the constitutionality of the act. Mr. Davis, once Democratic presidential nominee, classi-

fied the act as "vicious" and "the last word in the expansion of federal tyranny." A brief was submitted by Mr. Davis and James Piper of Baltimore, attorney for the trustees who originally brought the suit, and the government was granted permission to argue and present briefs.

Meanwhile the Federal Power Commission was moving forward with its efforts to administer its share of the Act —Title II—by seeking more funds in Congress and issuing regulations to bring more of the companies into line. The first step was Chairman Frank R. McNinch's attempt before a subcommittee to get the $3,600,000 the F.P.C. wants for administration compared with a budget figure of $1,709,000. The second was a rule requiring utilities applying to buy, sell or merge properties to declare themselves "public utilities subject to the Federal Power Act."

Other news affecting the holding company picture included the following:

American Superpower Corporation took steps to avoid holding company classification by transferring 1,500,000 shares of Commonwealth & Southern common stock to the Bankers Trust Company, the latter to act "as liquidator over a period of years."

Irving Trust Company, trustee for several utilities, was declared by the S.E.C. not to be a holding company under the terms of the law.

F.P.C. issued a set of orders governing transmission of power from the United States to a foreign country.

Federal Trade Commission urged segregation of gas and electric utilities.

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## $2,000,000 Expended on Underground Wires

Expenditures totaling $2,000,000 during 1935 for removing overhead wires and replacing them with underground construction is announced by Public Service Electric & Gas. Another $2,000,000 has been appropriated for such work in 1936 and, with the completion of projects started last year, 23 miles of street in 26 municipalities will have been cleared of wires.

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## Heavy Ice Hampers Hydro Plants in South

Unusually severe winter weather put a strain on public utilities in the South that was more trying than the line trouble not uncommon under such circumstances. For example, Louisville Gas & Electric Company for several days had to rely to a considerable extent on its standby steam generator plant with the heaviest ice since 1918 on the Ohio River seriously interfering with hydro generating. Wickets could not be lowered to let the ice through for several days because they had frozen into place.

Another instance: The power and light supply of Walland, Tenn., was threatened for several days by a break in the power dam on Little River.

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# Chicopee Taxpayers Oppose Holyoke Deal

Taxpayers of Chicopee, Mass., have begun suit in equity in Superior Court against Mayor Anthony J. Stonina, the city, members of the electric light board and the manager, seeking to enjoin them from entering into any contracts with the Holyoke Water Power Company.

The suit is the outcome of resentment on the part of large property owners and Chamber of Commerce officials at the action of two members of the Electric Light Commission in awarding the next fifteen years' power supply contract to Holyoke Water Power Company instead of Turners Falls Power & Electric Company, which now supplies the city (ELECTRICAL WORLD, January 4, page 100). The Turners Falls utility is the city's largest taxpayer.

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## Counties Back T.V.A.

Twelve counties in eastern Tennessee have notified T.V.A. of their approval for construction of rural lines along roads.

# 175,000 Farms to Get Electricity

**Cooke believes private companies will spend $50,000,000 for extension of rural lines during 1936 — Lists preliminary budgets of several companies**

Expenditures of about $50,000,000 by private utilities for rural electrification in 1936 is predicted by Morris L. Cooke, R.E.A. administrator, who estimates that, including R.E.A. projects, 175,000 farms will be electrified during the year. This would contrast with extension of service to 83,000 farms in 1935 and 30,396 in 1934, while Mr. Cooke states that about 827,000 rural customers of a possible 6,800,000 now are receiving service.

Private budgets for rural electrification in 1936 include the following:

| Company | State | Miles of Line | Customers | Cost |
|---|---|---|---|---|
| Baton Rouge Electric.... | La. | 115 | 450 | $131,000 |
| 4 U.G.I. subsidiaries.... | Pa., Del. | 133 | 573 | 175,254 |
| Dayton (Ohio) Pr. & Lt... | Ohio | 451 | 1,869 | 502,652 |
| Union Gas & Electric.... | Ohio, Ky. | 569 | 2,696 | 696,044 |
| Virginia Elec. & Pr..... | Va., N. C. | 150 | 700 | 200,000 |
| Central Hudson G. & E. | N. Y. | 500 | 2,000 | 898,000 |
| Puget Sound Pr. & Lt... | Wash. | 200 | 1,500 | 210,000 |
| C. & S., 11 subsidiaries.. | Mich., Ill., Ind., Ohio, Pa., Tenn., Ala., Ga., Fla., Miss., S.C. | 2,850 | 15,498 | 4,376,628 |
| North American Edison | Wis., Mich. | 270 | 760 | 347,400 |

The R.E.A. chief also announces ap-

## EXPERIMENT IN HIGHWAY SAFETY

**Use of sodium vapor lamps for illumination is being tried out near Sacramento, Calif., where this highway dips under a railway. Glare here might produce a "blind spot" in motorist's vision which would be worse than no light at all, and these two 1,000-cp. lamps, mounted on 23-ft. ornamental standards, seem to provide the answer.**

proval of engineering specifications and construction contracts on four of the projects which the federal agency has financed, enabling work to start on about 650 miles of line. The approvals were for three co-operatives—Indiana State-Wide, Miami Rural Electric, and Shelby Rural Electric—and one private line, Bartlett Community Light & Power.

The R.E.A. has just approved its first important loan to a privately owned utility, Florida Power Corporation receiving $164,500 for 184.6 miles of line in 21 sections of northern and western Florida. The project will serve 455 customers at $6.10 for the first 100 kw.-hr.

Other rural electrification news includes the following items:

INDIANA—Edward Cleaver, chairman of the Huntington County membership committee, states that an 86-mile line to cost $86,000 is practically assured with R.E.A. aid.

NEBRASKA — Southeastern Nebraska Public Power District, Beatrice, shortly will start work on 450 miles of line in Gage County.

NORTH CAROLINA — Farms totaling 14,319 in the state now have electricity and construction of 756.5 miles of line was started last year to serve 4,647 rural customers, private companies building 567.5 miles.

PENNSYLVANIA — West Penn Power plans 225 miles of line to serve 2,000 new customers at a $450,000 cost this year. In 1935 the company built 180 miles of line at a cost of $410,000.

VIRGINIA—Surveys of proposed lines in Mecklenburg County have been completed and submitted to the Public Service Commission.

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# Rates in Cincinnati Face New Revision

For two weeks the Rev. Herbert S. Bigelow, reputed local leader of Father Coughlin's National Union for Social Justice and lone independent member of Cincinnati's City Council, prevented the election of a Mayor. Of the eleven members four were Democrats and four Republicans, leaving him with the deciding vote, and this vote was available to either faction which would make him head of the utilities committee. The Democrats made the deal and Councilman Russell Wilson became Mayor.

Now Cincinnati is believed certainly to be due for reopening of the recently settled electric rate controversy as Councilman Bigelow, elected by the largest vote ever cast for an independent since the proportional representation system was adopted, had run on a platform of bringing in T.V.A. power or forcing the private companies immediately to meet T.V.A. rates.

Union Gas & Electric Company, a subsidiary of Columbia Gas & Electric, serves the city and would have to waive its present rate contract to meet Bigelow's demands.

# Army Starts Survey for Red River Dam

As a preliminary early construction of a power and water conservation dam on the Red River near Denison, Texas, the federal government has detailed a corps of Army engineers to make a survey of the project. While the primary purpose of the dam will be to control floodwaters, the proposed hydro-electric plant will be a source of income totaling approximately $2,260,000 annually, or more than sufficient to pay interest and principal on $26,000,000 of the cost in 30 years, it is estimated. It is planned to construct power transmission lines to serve a territory that has a population of 2,500,000 people. The tentative plans place the primary power at 337,276,000 kw.-hr.

The dam, according to the tentative plan, would be of earth construction, 160 ft. high and about 11,000 ft. long, to be built across the Red River about 5 miles north of Denison. The lake created, when full, would cover about 250,000 acres of land and would store 12,750,000 acre-feet of water. It is estimated that floodwaters in the Mississippi River in the lower area would be cut more than 3 ft. by the Red River dam.

# The Current Drift

### A Long-Range Power Plan

Senator George W. Norris of Nebraska is determined to push through a long-range government power program with elaborate rural ramifications. Any doubts are dispelled by his Mississippi Valley authority plan—a new T.V.A. involving half the nation—and his bill for a ten-year R.E.A. with $100,000,000 a year to spend.

While Senator Norris is nominally a Republican, he is a New Dealer at heart, at least as far as power is concerned, and from the White House itself came the statement recently that the people of Nebraska should force him to stay in the Senate for life. So, in view of the fact that Representative Sam Rayburn of Texas, Democratic co-author of the "death sentence," offered a House bill almost exactly like Norris' R.E.A. plan now before the Senate, there seems ample reason to believe that the Administration isn't inimical to the Nebraskan's ambitious proposals.

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### Two Cases Worth Watching

Two of the most important cases testing New Deal policies, from the public utilities' standpoint, now are pending by coincidence in Charlotte, N. C., before the federal Circuit Court of Appeals. They had been almost lost sight of, with the industry anxiously awaiting the Supreme Court's decision on T.V.A., but attention once more was drawn their way this week when arguments were heard on one—the appeal from Judge William C. Coleman's "unconstitutional in its entirety" ruling on the Public Utility Act of 1935.

This momentous holding company case is more important than ever in view of the government's efforts to confine the constitutionality test to its own Bond & Share case and the utilities' equally determined efforts to get a broader hearing. Thus the American States Public Service case may quite conceivably be the first into the Supreme Court.

Likewise, the other suit pending in Charlotte—Duke Power vs. P.W.A. on the validity of the agency's proposed loan for the Buzzard's Roost development which would compete with the private company—is headed straight for the high court. Enjoined once, the P.W.A. had the case remanded to the District Court when the new contract form was signed, but Judge H. H. Watkins issued another restraining order, so the suit goes back up to the Circuit Court on appeal. As the P.W.A. has had other such actions remanded, this one stands to be first into the Supreme Court in the "competing facilities" dispute.

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### Wall Street Holds Wake For T.V.A.

Wall Street and its purlieus have exhibited a strong belief lately that the Supreme Court's T.V.A. decision will be adverse to the government on the disposal of "surplus" power. This became apparent after the first A.A.A. decision, which was made the occasion for a week-long bullish demonstration in the public utility shares. When the court failed to deliver a decision on T.V.A. last Monday, however, some cold water was thrown on the market movement, not because sentiment was materially altered but because the move had carried about far enough from a technical standpoint.

While an upset for T.V.A. power may be in the cards, there is some doubt about the lasting effect of such a decision. It would not block federal dams for flood control or navigation; it might provide just the point the New Deal is looking for if a campaign is to be waged for changes in the Constitution.

Incidentally, a pending House resolution for constitutional modification would give the federal government the right to do just about anything in the world and public ownership of public utilities is specifically mentioned.

# New York Edison to Improve Plant

**Plans $5,000,000 expenditure on Waterside station — Holyoke Power, Laclede Electric and Washington Water Power also reveal appropriations**

A $5,000,000 appropriation by the New York Edison Company for modernization of its Waterside generating station added to the swelling utility budgets for expansion and improvement to meet rising energy consumption. This New York project, to be completed in a little over a year, involves installation of two new high-pressure boilers and one new generator with exhaust steam passing through existing low-pressure turbines.

Frank W. Smith, president of New York Edison, declared the company expects to increase efficiency through the improvement while cutting fuel consumption at the plant by half. Waterside, one of Edison's older plants, has 146 boilers of 5,526,000 lb. steam capacity per hour and nineteen generators of 376,200 kw. capacity. Thirty-six of the present boilers and three of the turbo-generators will be retired.

Another substantial project is that of Holyoke (Mass.) Water Power Company to increase its generating capacity. Robert E. Barrett, president, says the steam plant will be enlarged 17,500 kw., while a contract has been placed with the Riley Stoker Corporation for a boiler with an evaporating capacity of 200,000 lb. per hour. Normal boiler pressure will be 750 lb. per square inch at 750 deg. F. The height of the steam unit will be 80 ft. from basement to the housing of the draft equipment.

Holyoke's expansion also includes a 5,000-kw. high-pressure turbo-generator and a 12,500-kw. low-pressure machine. The construction is expected to simplify the company's tax problem. The decision to install a fuel-burning unit was influenced by the point that all the permanent water flow available in the Holyoke canals has been leased and by the cost of providing new hydro facilities near the present dam. During most of the year the system capacity, including 11,000 kw. in hydro units, will be 41,000 kw.

The courts will have to rule on Laclede Power & Light's proposed expenditure of $8,000,000 in the St. Louis area, a legal interpretation of the points involved having been asked, particularly in connection with the company's announced plan to strengthen its competition with Union Electric Light & Power. Laclede proposes to sell $6,000,000 in bonds and 30,000 shares of preferred stock if its plans are approved.

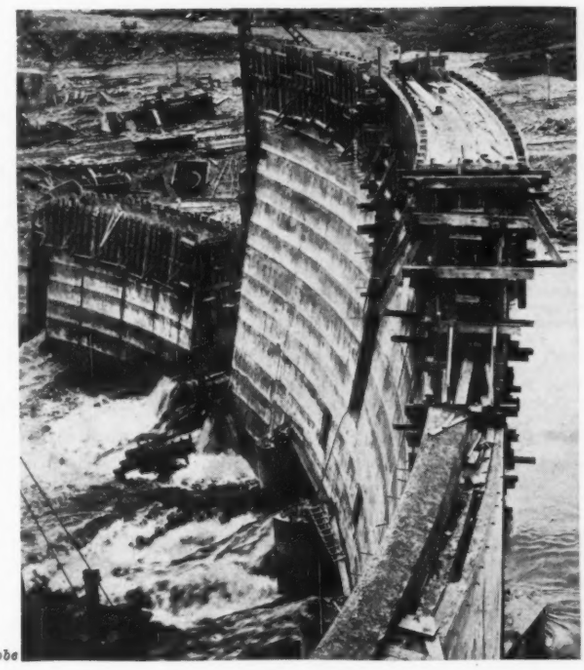
Further details on the Smith Mountain Power Company's proposed dam and distribution system (ELECTRICAL WORLD, January 11, page 4) reveals a proposed expenditure of between $4,000,000 and $5,000,000. The hydro project, which would be located on the Roanoke-Staunton River, calls for 30,000 hp. generating capacity and would compete to some extent with both Virginia Public Service Company and the Appalachian Electric Power Company.

Temporary permits have been issued for Virginia Electric & Power Company to start work on its new $250,000 power station and expansion of the present plant on Byrd Street, Richmond.

Construction of distribution lines by Washington Water Power Company, Spokane, this year will run to about $1,100,000, according to present plans. The company, which does its own line work, expects the program to occupy its crews for several months. Washington Water Power also plans an addition on its general office building this year.

## SCOTLAND HARNESSES WATER OF KEN

**No, this is NOT a T.V.A. project! This arch section, with temporary openings for passage of water, is part of the $15,000,000 development at Earlstoun, on the river Ken, designed to supply hydro-electric power for southwestern Scotland and the industiral north of England. Tunnels, acqueducts and power stations will be built later.**



*Globe*

# South Carolina Tax on Output Upheld

A decision handed down January 6 by the United States Circuit Court of Appeals at Charlotte, N. C., upheld the 1931 South Carolina law levying a tax of one-half mill per kilowatt-hour on electricity produced in the state. The ruling was in a case brought by the Duke Power Company, contesting the act as unconstitutional and declaring that, even if it were constitutional, the tax should be computed on "delivered" electricity, after deduction of transmission losses.

Judge John J. Parker ruled against the power company on both counts. Counsel for the company indicated the case would be carried to the Supreme Court.

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## Power District Fight

Opposition to unification of Nebraska's three public power projects came from a new quarter when Platte River Water Association applied for an injunction against Platte Valley Public Power District entering the arrangement, declaring Platte Valley would find it detrimental to be merged with the Loup Valley and Central Nebraska (Tri-County) projects. Success of the Loup district is called questionable.

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## Pay Cuts Restored

Pay levels prevailing prior to August 1, 1932, have been restored by the Commonwealth Edison Company and the Public Service Company of Northern Illinois, two important units in the former Insull system. Two-thirds of the 10 per cent reduction had been restored previously and the final third was given back to employees as of January 1.

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## Tokio Light to Register

An application for registration of $57,996,000 6 per cent first mortgage bonds of Tokio Electric Light Company (Tokio Dento Kabushiki Kaisha) is announced by the Securities and Exchange Commission in its drive to secure registration of foreign securities traded on exchanges in this country.

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## Virginia Electric Expands

Purchase of lines serving Colerain, Powellsville and Harrellsville, N. C., by the Virginia Electric & Power Company is announced by R. H. Goodman, district manager for the company. The Virginia company, controlled by Engineers Public Service, serves a considerable area in northeastern North Carolina.

# New York City Darkened by Hell Gate Station Fire

**Short circuit and blaze put all but three turbines out of action at outset, but fourth is added in four hours and fifth in six as extra crews push work — Niagara Hudson connection called upon**

Homeward-bound crowds were tied up in subways and most of Manhattan above 59th Street was darkened for about three hours Wednesday by a short circuit and fire shortly after 4 p.m. in the Hell Gate station of the New York Edison Company. During the general confusion hospitals performed emergency operations with makeshift lights, street lamps blinked on and off disconcertingly, passengers here and there were trapped in elevators stalled between floors, and prices as high as 50 cents for the lowly candle were reported. The Bronx and Westchester County also were affected.

From the technical angle it is not yet possible to give a rigid explanation of the initiating cause of the interruption. That the short circuit occurred in the reactors or the cables between them and the generators is the tentative explanation offered unofficially. Each generator phase is provided with a solidly connected reactor between it and its group bus from which run the six feeders to the a.c. network of the Bronx and uptown Manhattan. Generator protection is differential and there is a neutral bus for each two generators with an 8.4-ohm ground resistor. Phase isolation is the outstanding characteristic of the station design and the several galleries of each phase are arranged vertically as follows: Reactors, generator and feeder switches, mechanism, main and auxiliary bus, mechanism, bus tie and ventilating fans.

The failure of protection seems to have started a fire at several points in the generator-reactor leads and the havoc spread to the generators and the various levels of the bus galleries. It is reported that two generators were burned out and it thus will be some weeks before the station can be restored to full capacity. But, considering the extent of the damage, the service was restored in a remarkably short time. Crews were hurried from all parts of the Consolidated system. Reserve units at Hudson Avenue and Sherman Creek were put on the line and use made of the connection with Niagara-Hudson through the Central Hudson and New York Power & Light systems. Westchester County service was restored in twelve minutes, the Bronx in about half an hour, according to the public statement of President Frank W. Smith, who, at the same time, accorded high credit to the efficacy of city police and fire departments for the co-operation they contributed all over the affected area.

R. H. Tapscott, vice-president, said that three turbines were kept running throughout the worst of the untoward failure, a fourth was added within four hours and a fifth was ready six hours after the beginning of the trouble.

Mayor Fiorello H. LaGuardia declined to gloat over the misfortune of the utility company, saying "an accident may happen in a municipal plant just as well."

It is hoped that the full technical details can be rounded up for later presentation so that the art may learn what there may be to learn about prevention of a recurrence on any metropolitan system.

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## Canadian Association to Meet January 23

Arrangements have been made for an attendance of 175 when the Canadian Electrical Association opens its third annual winter conference of association committees in Montreal January 23. R. B. Baxter, president of the association, will be chairman of the two-day meeting. A much larger attendance is expected at the dinner marking the end of the first day's sessions, with utility executives and manufacturers from all over eastern Canada joining the committee members on that occasion.

## COMING MEETINGS

**Canadian Electrical Association** — Midwinter conference, Montreal, Que., January 23-24. B. C. Fairchild, secretary, 409 Power Building, Montreal, Que.

**American Institute of Electrical Engineers**—Winter convention, New York, N. Y., January 28-31. H. H. Henline, national secretary, 33 West 39th Street, New York, N. Y.

**National Electrical Manufacturers Association**—Midwinter meeting, Waldorf-Astoria Hotel, New York, February 3-8. W. J. Donald, managing director, 155 East 44th St., New York.

**Midwest Power Engineering Conference** Chicago, Ill., April 20-24. G. E. Pfisterer, secretary, 308 West Washington St., Chicago, Ill.

**Electrochemical Society** — Spring meeting, Cincinnati, Ohio, April 23-25. Colin G. Fink, secretary, Columbia University, New York, N. Y.

**Missouri Association of Public Utilities** —Annual meeting, St. Louis, Mo., April 29-May 1. Jesse Blythe, assistant secretary, Merchants Bank Bldg., 101 West High St., Jefferson City, Mo.

## Utility Customers Get Merchandise Orders

January bills sent out by the Coast Counties Gas & Electric Company, affiliate of Pacific Public Service, will include a novel merchandise gift—one-half the amount of the month's charge will be given back in the form of an order on any co-operating electrical dealer and good for appliances or lamps. Coast Counties operates in four counties south of San Francisco.

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## Sleet Damage Repaired

Although Georgia Power Company officials are not yet able to place the damage to their properties at any definite figure, it is being unofficially stated that the damage caused by the worst sleet storm in the past 30 years, occurring on December 28, will approximate $1,000,000. More than 500 men—eighteen emergency power company crews, supplemented by two crews from Athens and two more from Montgomery, Ala.—have restored all power connections.

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## Gets Exposition Space

The first contract for space in the Electrical Building at the Great Lakes Exposition, to be held in Cleveland next summer, was signed by Apex Electric Manufacturing Company. Apex is to use 1,200 sq.ft. of floor space.

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## Sodium Lighting Tried

Extensive sodium lighting of roads in the Puget Sound area's foggier districts is promised by Washington's State Highway Director, Lacey V. Murrow, if the 3-mile experiment between South Tacoma and Fort Lewis—the first such test in the Pacific Northwest—proves successful. The sodium lighting on the Lakeview cutoff was put into operation the first of last month and Mr. Murrow points out that reports on results are not yet conclusive.

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## Asks to Reorganize

An application to reorganize has been filed in federal court by the Kentucky Public Service Company of Glasgow, Ky., listing liabilities of $844,617 and assets exclusive of plant, lines and other equipment, of $11,592. The company operates electric plants in Glasgow, Cave City, Horse Cave, Glasgow Junction, Hiseville, Smiths' Grove and Leitchfield.

# Energy Output Resumes High Level

After the usual recession during the holidays the output of electric light and power plants resumed its high level. For the week ended January 11 it amounted to 1,970,578,000 kw.-hr., according to the Edison Electric Institute. This was 11.2 per cent more than a year ago and 8.5 per cent more than in the corresponding period of the winter of 1929-1930. As usual, also, production was somewhat smaller than the December peak. The decrease was about 32,000,000 kw.-hr., compared with 10,000,000 kw.-hr. last year and 44,000,000 kw.-hr. six years ago.

The movement, therefore, continues to be parallel with that registered a year ago, but the figures are running 11 or 12 per cent higher. From the regional figures it is evident that the gain over January, 1935, was general throughout the country with the Rocky Mountain, Southern and Central Industrial regions leading.

**Per Cent Change from Previous Year**

| Region | Week ended Jan. 11 | Jan. 4 | Dec. 28 |
|---|---|---|---|
| New England | + 7.6 | + 9.4 | + 9.0 |
| Middle Atlantic | +10.1 | +10.7 | + 9.8 |
| Central Industrial | +12.1 | +12.3 | +13.6 |
| West Central | +11.9 | +12.4 | +12.6 |
| Southern States | +13.6 | +12.0 | +13.3 |
| Rocky Mountain | +21.5 | +18.1 | +20.5 |
| Pacific Coast | +10.9 | +11.1 | +14.1 |
| United States | +11.2 | +11.2 | +11.9 |

**Weekly Output, Millions of Kw.-Hr.**

| 1936 | | 1935 | | 1934 | |
|---|---|---|---|---|---|
| Jan. 11 | 1,971 | Jan. 12 | 1,773 | Jan. 13 | 1,646 |
| Jan. 4 | 1,855 | Jan. 5 | 1,669 | Jan. 6 | 1,564 |
| **1935** | | **1934** | | **1933** | |
| Dec. 28 | 1,847 | Dec. 29 | 1,650 | Dec. 30 | 1,539 |
| Dec. 21 | 2,002 | Dec. 22 | 1,788 | Dec. 23 | 1,657 |
| Dec. 14 | 1,983 | Dec. 15 | 1,767 | Dec. 16 | 1,644 |
| Dec. 7 | 1,970 | Dec. 8 | 1,743 | Dec. 9 | 1,619 |

## Montreal Light to Cut Bonded Debt

Decision to complete refunding of the entire outstanding bonded indebtedness of Montreal Light, Heat & Power Consolidated was announced by President John S. Norris, following a meeting of the board of directors held January 13.

In consequence, the outstanding Series "A" 5 per cent first refunding and collateral trust bonds, due October 1, 1951, of $27,615,000 principal amount, are being called for redemption on April 1. Funds will be provided in part by $15,000,000 of newly created first mortgage and collateral trust bonds, and in part by cash and other treasury resources.

The bonds authorized for immediate issue comprise $5,000,000 principal amount of one to five year 2½ per cent serial bonds, and $10,000,000 principal amount 3½ per cent twenty-year sinking fund bonds. The 2½ per cent series have been disposed of privately, while the 3½ per cent series will be offered for public subscription.

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### Bank Confirms Sale of United Light Stock

Final arrangements have been ironed out and the 448,667 United Light & Power Company class B shares owned by the Chase National Bank conveyed to a group of six investment trusts, the bank announced officially this week. The deal covers about 42 per cent of the voting stock and was undertaken, it is believed, partially to remove any possibility of the bank coming under the jurisdiction of the Public Utility Act of 1935. The amount involved in the transfer was not revealed but the market value of the shares was close to $3,500,000 at the time the deal was closed.

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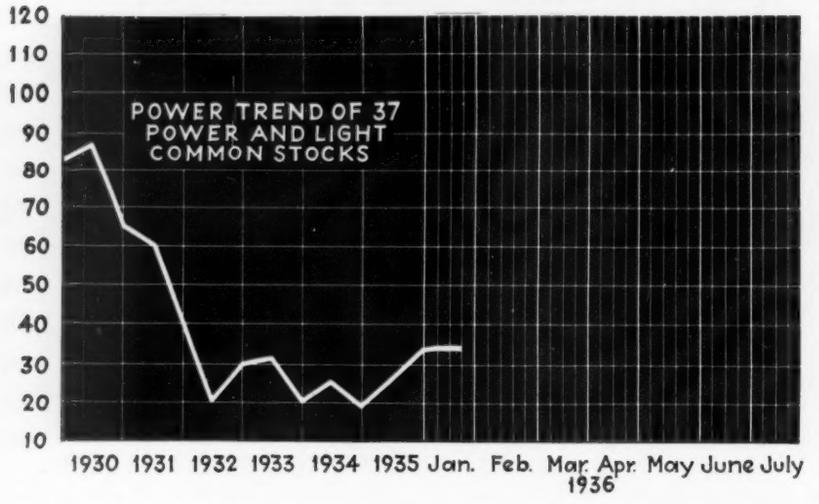
### Reorganization Revised

Directors and the reorganization committee of Peoples Light & Power Corporation have agreed to a revised reorganization plan whereby first lien bonds will get 50 per cent of their par value in Texas Public Service first mortgage 5s, the other half in 6s of the reorganized company, along with a 43 per cent common stock interest, and both cash and scrip for back interest. Debentures, notes and unsecured creditors get preferred and common stock.

## Utility Stocks Move Upward




**Prices of electric light and power stocks continued their advance. Gains during the week were sufficient to carry the "Electrical World" index to 35.3, from 35.1 last week.**

## Financing Blockade Broken by S.E.C.

The Securities and Exchange Commission is not going to hold up recovery by refusing to allow the sale of bonds by operating utilities even though their parent companies are opposing the enforcement of the Public Utility Act of 1935. This became clear this week when the S.E.C. granted registration for $27,000,000 first mortgage 3½s, due 1966, of West Penn Power Company, offered publicly on Wednesday at 103.

West Penn was the first company to seek registration after December 1 for an issue, while not complying with the act. West Penn asked exemption for itself and its subsidiaries, but its parent company, American Water Works & Electric, is lined up with the concerns testing the act in the courts.

*N. Y. Edison plans issue*

Application has been made by the New York Edison Company, Inc., to the state Public Service Commission for permission to issue $55,000,000 of 3½ per cent Series D first lien and refunding mortgage bonds, due in 1966. The petition states that the company believes the proposed issue can be sold to bankers to yield not less than 99 per cent of the principal amount. Such a sale would be regarded by the utility as advantageous, having in mind the existing facts as to the financing of public utility enterprises.

Proceeds are to be used to redeem $30,000,000 of New York Edison 5s due in 1944 and $25,000,000 of 5s due in 1951, both of which are callable at 104 on April 1, 1936. The company also has an issue of $30,000,000 of 6½s which is not redeemable before October 1, 1936. The new issue is another step in the Consolidated Gas system's financing program. The system is merging certain of its affiliated companies with the purpose of effecting economies in operation as part of the plan to put into effect new low electric rates. The savings which will result from refunding outstanding bonds into ones bearing lower interest rates is also part of the program.

## J. C. Power Sought by Associated Gas

Acquisition of another Eastern seaboard property of the former Insull system by the Associated Gas & Electric System is under negotiation with completion understood to be largely dependent upon clarification of the merger's status under the Public Utility Act of 1935. The deal involves purchase of the 712,411 shares of the common stock (about 62 per cent) pledged under National Public Service Corporation's 5 per cent debentures. Associated Gas already owns a substantial interest through 163,350 common shares purchased from the Central Hanover Bank & Trust Company. The bank had bid in at auction in 1932 this stock, which had been pledged against loans.

National Public Service formerly controlled Jersey Central Power and the protective committee for its debentures for over two years have sought sufficient deposits under their plan for taking over the pledged stock, now virtually the only security. This plan has been extended to May 1 and the committee simultaneously revealed that the negotiations have been in progress for six months, with Associated Gas the principal interested party.

Jersey Central has electric capacity of 149,100 kw. as well as eight gas and two water plants.

## Current Earnings Report

**Operating Companies**

| | 1935 | 1934 |
|---|---|---|
| Alabama Power (Year to Nov. 30) | | |
| Gross earnings.... | $16,540,488 | $15,402,476 |
| Net balance..... | 516,809 | 537,432 |
| Con. Gas Elec. Lt. & Pwr. Baltimore (Year ended Nov. 30) | | |
| Gross earnings.... | 30,676,618 | 28,866,854 |
| Net balance..... | 5,049,749 | 4,726,352 |
| Detroit Edison (Year ended Nov. 30) | | |
| Gross earnings.... | 48,917,758 | 44,747,611 |
| Net balance..... | 7,500,848 | 6,884,029 |
| Duquesne Light (Year ended Oct. 31) | | |
| Gross earnings.... | 25,658,159 | 25,299,036 |
| Net balance*..... | 10,421,003 | 9,803,088 |
| Georgia Power (Year to Nov. 30) | | |
| Gross earnings.... | 23,469,676 | 22,075,400 |
| Net balance..... | 1,684,080 | 969,559 |
| Kansas City Pwr. & Lt. (Year ended Nov. 30) | | |
| Gross earnings.... | 15,666,963 | 14,707,724 |
| Net balance*..... | 3,620,073 | 3,272,099 |
| Louisville Gas & Elec. (Year ended Oct. 31) | | |
| Gross earnings.... | 10,266,947 | 9,945,812 |
| Net balance..... | 1,411,430 | 1,487,759 |
| Ohio Edison (Year to Nov. 30) | | |
| Gross earnings.... | 15,819,716 | 15,158,831 |
| Net balance..... | 1,591,662 | 1,295,699 |
| Tennessee Elec. Pwr. (Year to Nov. 30) | | |
| Gross earnings.... | 13,266,925 | 12,355,947 |
| Net balance..... | 439,940 | 368,573 |
| Virginia Elec. & Pwr. (Year ended Oct. 31) | | |
| Gross earnings.... | 15,251,008 | 15,053,815 |
| Net balance..... | 1,648,769 | 1,480,813 |

**Holding Companies**

| | 1935 | 1934 |
|---|---|---|
| American & Foreign Power & subs. (Year ended Sept. 30) | | |
| Gross earnings.... | $55,939,602 | $55,795,551 |
| Net balance..... | 3,720,375 | 2,553,428 |
| American Gas & Elec. & subs. (Year to Oct. 31) | | |
| Gross earnings.... | 65,151,622 | 61,883,493 |
| Net balance..... | 8,104,796 | 7,281,395 |
| Amer. Pwr. & Lt. & subs. (Year ended Nov. 30) | | |
| Gross earnings.... | 82,456,057 | 75,771,815 |
| Net balance..... | 7,505,889 | 3,670,926 |
| Commonwealth & Southern & subs. (Year ended Nov. 30) | | |
| Gross earnings.... | 120,968,555 | 114,562,788 |
| Net balance..... | 51,230 | 760,582† |
| Electric Power & Light & subs. (Year ended Nov. 30) | | |
| Gross earnings.... | 77,406,312 | 73,546,551 |
| Net balance..... | 888,723 | 338,422† |
| Engineers Public Service & subs. (Year to Nov. 30) | | |
| Gross earnings.... | 45,696,578 | 44,405,069 |
| Net balance..... | 880,131† | 1,351,436† |
| National Pwr. & Lt. & subs. (Year ended Nov. 30) | | |
| Gross earnings.... | 71,897,875 | 71,789,665 |
| Net balance..... | 6,001,619 | 6,791,370 |
| Public Service Corp. of N. J. & subs. (Year ended Nov. 30) | | |
| Gross earnings.... | 119,403,078 | 120,327,006 |
| Net balance..... | 24,175,483* | 24,725,073* |

*Available for all dividends. †Deficit.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net balance—Balance available from income for common stock dividends.

# MANUFACTURING AND MARKETS

## Business Curve Flattens Out

**Favorable**

- Power output rises again.
- Stock buyers expect T.V.A. upset.
- Utility financing jam broken.
- Steel plants report small gain.

**Unfavorable**

- New inflation threats appear.
- Long Congress session believed sure.
- Automobile trade slackens.
- A.A.A. decisions unsettle some lines.

## Canadian Group Issues Standards

Twenty-one approval specifications, outlining the conditions which must be met by various types of equipment in order to secure approval for sale in Canada, have been approved under Part II of the Canadian Electrical Code and published by the Canadian Engineering Standards Association. The use of unapproved electrical equipment is now illegal in all provinces of Canada which have officially adopted the Canadian Electrical Code. These provinces include Prince Edward Island, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia and Nova Scotia. Following is the list of specifications for construction and test, already approved:

No. 0—1932. Definitions and general requirements; No. 1—1932. Power-operated radio devices; No. 2—1933. Electric signs; No. 3—1933. Electrical equipment for oil-burning apparatus; No. 5—1934. Service-entrance and branch circuit-breakers; No. 6—1933. Electric clocks; No. 7—1933. Portable electric displays and incandescent-lamp signs; No. 8—1934. Capacitors (electrical condensers); No. 9—1933. Electric fixtures; No. 10—1933. Electric floor surfacing and cleaning machines; No. 11—1934. Fractional-horsepower motors; No. 12—1934. Electric portable lighting devices (portables); No. 13—1935. Transformers for A—Luminous-tube signs, and B—Oil-burner ignition equipment; No. 14—1935. Industrial control equipment in ordinary (i.e., non-hazardous) locations; No. 16—1935. Insulated conductors for power-operated radio devices; No. 17—1935. Cable for luminous-tube signs and for oil-burner ignition equipment; No. 18—1934. Outlet boxes; No. 19—1935. Soldering lugs; No. 20—1935. Motor-operated blowers and stokers; No. 21—1935. Cord sets; No. 22—1935. Electrical equipment for measuring and discharge devices for explosive or flammable liquids.

•

### "Blue Cards" Bear Fruit

Employee "tips," sales department standby with Puget Sound Power & Light Company, bore results again in 1935. There were 11,122 such blue card tips turned in by meter readers, service men, substation operators, construction men, accountants, stenographers, vice-presidents; 20 per cent of them were translated into orders.

•

### Kearney Sets Record

The year just closed was the best in James R. Kearney Corporation's history, salesmen were told at the annual sales convention in St. Louis, while expectations are for another business increase in 1936.

•

### Complaint on Lamps

Another Federal Trade Commission complaint alleging unfair competition in the sale of incandescent lamps has been issued, the third in the last few weeks. The commission charges Atlas Products Company of Newark with demonstrations tending to deceive prospective purchasers into believing that its lamps were of the same watt measurement and produced more light than those of competitors.

•

### N.E.M.A. Now a Member of Producers' Council

Another step in N.E.M.A.'s program of keeping in close contact with all building construction interests has just been announced, the association revealing the fact that it has joined the Producers' Council, a national organization of manufacturers of many lines of building materials and equipment and affiliated with the American Institute of Architects. It is pointed out that membership should facilitate giving architects, engineers and other interested parties the latest information on improved electrical products and their uses.

•

### Leonard's Sales Rise

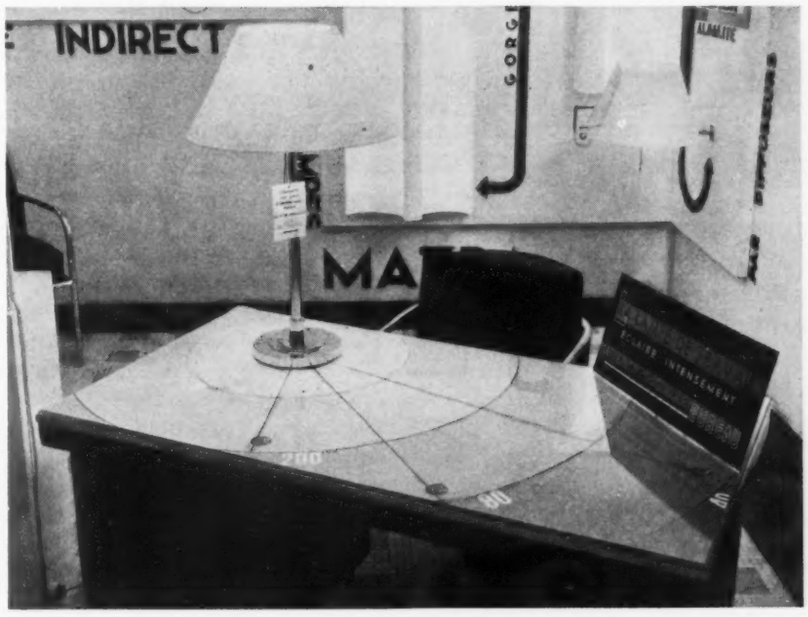
Shipments by Leonard Refrigerator Company in the final 1935 quarter were 7,835 units, compared with 4,389 in the corresponding 1934 period.

•

### Appliance Sales Gain

Sales of major electric appliances by Pacific Gas & Electric last year rose $4,500,000 over 1934, led by refrigerators with a 54 per cent gain.

### FRANCE ESPOUSES "BETTER LIGHT"




**This is "the work lamp" which "illuminates brightly all parts of the office." It was part of the exhibit of the Compagnie des Lampes, developed along the lines pioneered by I.E.S., on display at the annual Salon de la Lumiere. A. L. Powell, who was I.E.S. president at the time, supplied the International Commission on Illumination with data on American experience in the campaign during the commission's recent meeting in Paris.**

## Inspectors Review Their Safety Drive

Contractors' business is being built and installation standards raised as a result of the safety campaign sponsored by the International Association of Electrical Inspectors, the association states in reviewing the year's work. The report also declares that utilities state service has been improved. The campaign urged that the public insist upon approved materials, the employment of qualified contractors and authorized electrical inspection.

•

## General Electric Orders Total $217,361,587 in 1934

Orders received by the General Electric Company in 1935 amounted to $217,361,587, compared with $183,660,303 during 1934, an increase of 18 per cent, President Gerard Swope announced this week. For the quarter ended December 31 orders were $58,417,822, compared with $51,046,760 for the last quarter of 1934, an increase of 14 per cent.

Sales billed and earnings for the year 1935 are not yet available. A complete annual report will be issued in March.

•

## Allen Sees Peak Year for Appliance Sales

Launching the Golden Jubilee year sales drive at a luncheon in New York, A. E. Allen, Westinghouse Electric vice-president in charge of merchandising, predicted a higher mark in appliance sales than the peak in 1929. Mr. Allen cited pent-up purchasing power, generally improved business and the greater consciousness toward improvement and maintenance of the home as factors which will contribute to this business increase.

•

## Appliance Association Formed in Alabama

The Electrical Appliance Association of Alabama and West Florida has been organized with membership open to dealers, wholesalers, utilities and manufacturers. Temporary officers are: J. S. Shaw, manager of the electrical department of Moore-Handley Hardware Company, Birmingham, president; Neal Collins, Frank Tennille Furniture Company, Montgomery, vice-president, and Marion Robertson, Alabama Power Company, Birmingham, secretary.

A co-operative merchandising program will be promoted throughout this year.

## New York Metal Prices

| | Jan. 8, 1936 Cents per Pound | Jan. 15, 1936 Cents per Pound |
|---|---|---|
| Copper electrolytic | 9.25* | 9.25* |
| Lead, Am. S. & R. price | 4.50 | 4.50 |
| Antimony | 13.00 | 13.625 |
| Nickel ingot | 35.00 | 35.00 |
| Zinc spot | 5.225 | 5.225 |
| Tin Straits | 47.00 | 47.75 |
| Aluminum, 99 per cent | 19—21 | 19—21 |

*Delivered Connecticut Valley.

## Wire Maker Cuts Capital

Anaconda Wire & Cable stockholders will vote January 27 on a cut in the capital to $16,898,800 from $20,270,717, the difference to be transferred to paid-in surplus. Write-downs in inventories and for obsolescence totaling $2,516,596 have already been charged to paid-in surplus.

# Field Reports on Business

Optimism prevails in industrial circles despite some leveling off in the business curve, reports to ELECTRICAL WORLD indicate.

### NEW ENGLAND

Inquiries for quotations on electrical equipment are steady and in good volume and sales during the first fortnight of 1936 show marked gains as compared with last year. One prominent manufacturer reports an increase of over 25 per cent in equipment sales for the first week in January compared with a year ago and a prominent manufacturer of industrial heating equipment records encouraging activity, reporting orders received for six heat-treating furnaces so far in 1936. The Holyoke Water Power Company has ordered a 750-deg., 750-lb. water tube boiler (200,000 lb. steam per hour) from Riley Stoker Corporation, Worcester, Mass. Plans are under consideration for additional steam-electric generating capacity.

Domestic refrigerator sales and electric range orders are being received and surpass the volume of orders for the same period last year; more than 300 refrigerators and 250 electric ranges were sold by one prominent distributor during the first week in January. Orders for about 500 domestic refrigerators and ranges are pending with this firm. Small domestic electric appliance sales have started out briskly for 1936, according to one manufacturer, due in part to changes in styles, improvement in design and an increasing public inclination to spend money.

Building contracts continue to keep up to a good level in this district; a parkway unit order amounting to $100,000 has been received by the Wheeler Reflector Company for New York City.

### PACIFIC COAST

Orders as well as prospects seem to justify prevailing optimism as well-rounded business is reported by manufacturers and wholesalers. The supply business features lighting material, showing that many jobs are actually at the buying stage, and small appliances, proving that bumper holiday business wiped out dealers' stocks. Manufacturers report an excellent demand for meters and transformers from all over the power network but especially from the San Joaquin Valley. Coast plants are working to capacity on these items.

The week's outstanding order covers a $50,000 lamp contract from a railroad which will probably gross 50 per cent additional. The outstanding inquiry covers half a million feet of assorted power cables from the Reclamation Bureau in Denver for Boulder Dam powerhouse.

Widespread educational campaigns are being carried on by the power companies in accordance with their expressed determination to look to dealers for the bulk of revenue producing items. Pacific Gas & Electric Company is holding such meetings with dealers in Eureka. Wholesalers have supplemented their annual sales conferences by sending selected groups, such as major appliance salesmen, back to their factories for intensive training, a practice discontinued for several years.

Pacific Gas & Electric announces important new construction in the Bieber area of the Sierras to tap mining and lumber districts hitherto considered too expensive and unremunerative for a standard system. Low grade construction with lighter hardware and longer spans is planned to cost about $350,000 and pole and line hardware plants along the coast are revamping their designs accordingly.

### NEW YORK

Business sentiment remains confident but the upswing flattened out somewhat at mid-month. Washington developments could readily have been seized upon by the pessimists, but the fact that industrial indexes are maintaining their wide margins over a year ago seems to be about all business men are asking. Power output has risen further, but simply maintained its 11.2 per cent increase over the comparable 1935 week. Steel operations are no better than steady with the tin plate rate curtailed, and automobile production is hesitant as a result of the distressing accumulation of used cars.

In the meantime, the utilities are standing by, awaiting the outcome of important litigation—the appeal from Judge Coleman's decision was heard in Circuit Court this week and a ruling is not far off, in addition to widespread interest in the Supreme Court's imminent verdict on T.V.A. Expansion projects, nevertheless, are afoot and New York Edison is spending $5,000,000 on its Waterside station. Copper markets are coming more and more to regard the utilities' buying attitude as the governing factor in the hoped-for price rise. Buying of the red metal continues fairly brisk.

### CHICAGO

Despite the seasonal after-holiday let down, trade in this area is maintaining a level considerably above that of a year ago. Electrical appliance sales are holding up better than anticipated. Manufacturers of motor and control equipment report a substantial increase in business, much of which is due to rehabilitation of industrial plants and equipment. Although electric power production declined from the preceding week, a substantial gain was registered over 1935.

Construction in the suburban territory last year set a record with the volume rising to slightly more than twice the 1934 total. This gratifying picture is reflected in the improvement shown by electrical contractors and fixture manufacturers. One representative fixture company reports not only new orders but a considerable increase in the amount of individual orders. Loadings show a slightly greater than seasonal expansion.

In spite of such developments as the Supreme Court invalidation of the A.A.A., passage of a bonus payment measure in the House and the confusing activity at the national capital as the Administration sought a substitute farm program, a minimum of disturbance was created and business activity expanded on a wide front.

# *Oil-Filled*

## THE MOST RELIABLE, EFFICIENT, AND ECONOMICAL OF ALL CABLE SYSTEMS

### As proved by the service record of 3,770,000 feet . . . not a single electrical cable failure in eight years

EIGHT YEARS' experience, starting with two big installations of 132-kv cable—19 miles in Chicago and 36 miles in New York—demonstrates the true worth of the oil-filled-cable system.

Today, the length of oil-filled cable installed or under manufacture in the United States has reached the total of 790,000 feet, and in the whole world, a total of 3,770,000 feet.

Yet, not in one installation has there been a single electrical cable failure.

This record should lead to even a greater confidence in the oil-filled-cable system. It is reliable, efficient, and economical.

**New Savings of 25 Per Cent**

Now, oil-filled cable offers new economies. Better methods of handling and installing, as well as improvements in the cable itself and in accessories, have so lowered the cost that for installations today the reduction actually will amount to savings of more than 25 per cent as compared with previous installations.

**The Trend to Lower Voltages**

While intensive research and development work is still being carried on covering all types of systems, every evidence points to the fact that oil-filled cable is the best today for important circuits.

In the medium-voltage classes, even though the initial cost per circuit may be higher than for other types, the reliability of the oil-filled-cable system, assuring continuity of service with fewer circuits, more than justifies its use in this field. The annual operating cost with oil-filled-cable systems shows actual savings. General Electric Company, Schenectady, New York.

520-56

**GENERAL ELECTRIC**

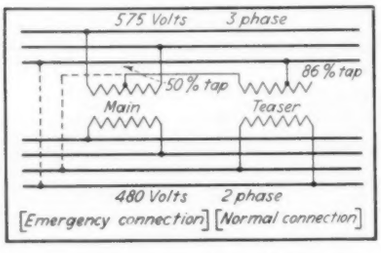
# OPERATING PRACTICES

***New ideas and practices in the operation of well-designed, constructed and maintained plants and systems***

## One Transformer T-Connection

By ROBERT B. CAPRON
Utica Gas & Electric Company

Transformer failure with no spare available necessitated the adoption of a unique transformer connection by the Utica Gas & Electric Company to insure continuity of service to a large industrial customer. The transformer in question was the teaser of a 400-kva. Scott bank used to step 575 volts, three phase, down to 480 volts, two phase.




**Emergency connection gives three- to two-phase power from one transformer**

Although use of a double transformation from 575 to 4,000 to 480 volts was considered, calculation showed this was unnecessary. Due to the nature of the Scott connection voltage across the primary of the teaser transformer had been 498 volts (*i.e.*, $0.86 \times 575$), only 18 volts above that needed for the secondary. In view of this fact the faulty teaser transformer was disconnected and bypassed by connecting each of its primary leads directly to the corresponding secondary lead as shown ("emergency connection") in the accompanying diagram.

This connection impressed the teaser primary voltage on one phase of the secondary, but the resulting secondary unbalance was less than 5 per cent; 484 volts on the normal phase and 505 volts on the other. This temporary connection served satisfactorily for more than five weeks until the teaser transformer could be repaired and returned to service. Although there is no possibility of phase displacement, polarity of the displaced unit must be checked to insure correct phase rotation.

•

## Static Condensers Improved System P.F.

Noteworthy as an illustration of the successful application of fairly large capacitor groups to central-station practice is a 5,000-kva. static condenser application in the system of the Saxony-Thuringia Power Company, Germany. According to a report in *ETZ*, this was to take advantage of a favorable rate for power purchased under a kva. demand clause.

Changing an existing 6,000-kva. turbo-generator into a 5,000-kva. synchronous generator would have cost about $8,000. Installation of a 10-kv. condenser group of 5,000 kva. cost about $48,000. Owing to the difference in losses, 300 kw. against 10 kw., the condenser installation proved to be more economical in spite of higher first cost. The condensers were built to withstand continuous operation at 10 per cent overvoltage and continuous overcurrents of 100 per cent, preferably when caused by the fifth harmonic. The latter requirement has since been found unnecessary.

Operating results available up to the present indicate that the much-feared phenomena of harmonics and resonance in medium-voltage systems can be avoided. Data of the higher harmonics in the voltage curve for loads between 3,450 kw. and 900 kw. indicate that there is little appreciable variation in the percentage value of the third, fifth, seventh and ninth harmonics. All of them are less than 5 per cent of the fundamental voltage wave, it was stated.

•

## Oil-Fields Reels for Wire Rewinding

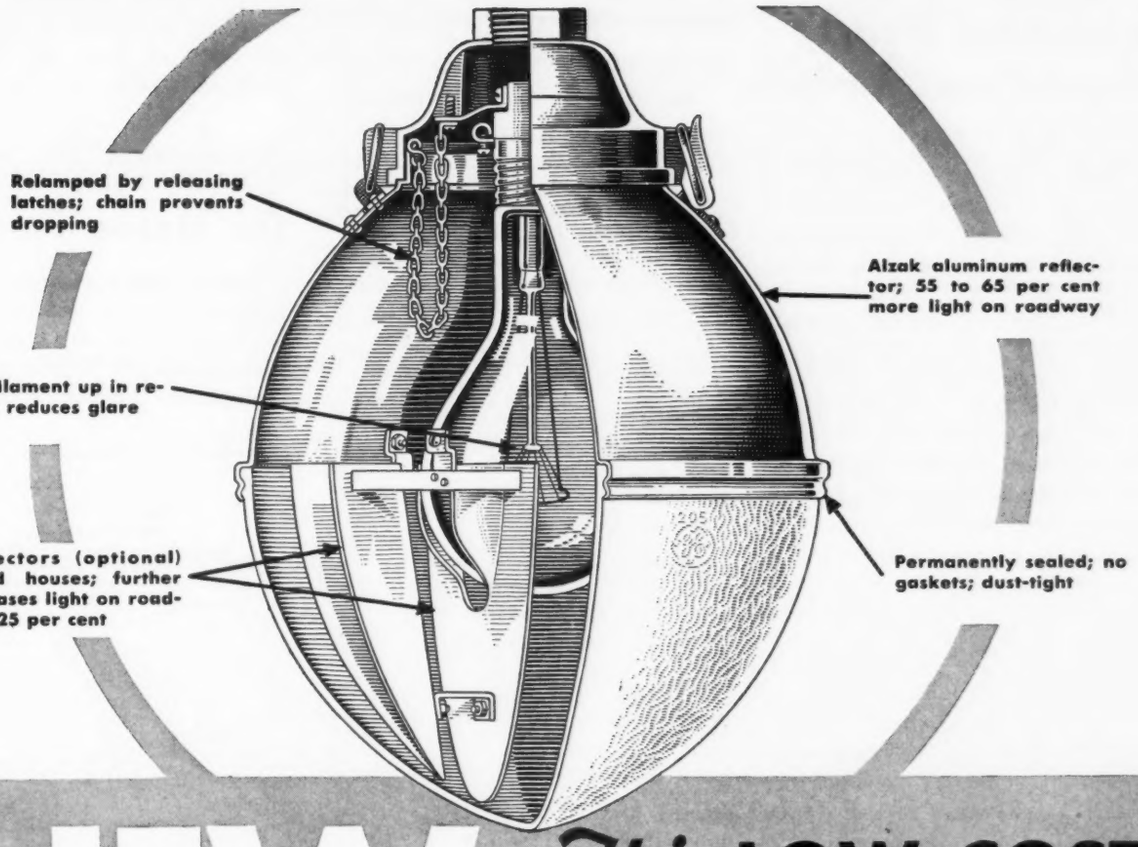
By CARL R. WENZ
Assistant Superintendent of Construction
Oklahoma Gas & Electric Company

Demand for rapid rewinding and removal from the field of large quantities of conductors in three-phase, oil-field extension work provided the motivation for development of the power-driven, wire-winding device illustrated. This equipment is capable of rewinding three conductors simultaneously. The tire friction permits sufficient tension on the wire to give an evenly and tightly coiled reel of wire. This convertible rewinding and stringing device frame is equipped with interchangeable shafts for the wire reels. One set of shafts is equipped with brake drums for stringing wire and the other set of shafts is equipped with sprockets for wire rewinding.

Leverage is transmitted from reel shafts to reels by means of bars welded to the shafts and resting against the reel bolts. Collars on the opposite sides of the reels hold the bars tightly against the reel sides.

Bar resting against heads of original reel bolts provides leverage from reel shaft.
Max. Dia.=46"
Sprocket
Sprocket
Chain drive
Sprocket on winch
Ground connection to adequate ground for hot work.

**For winding up wire in the field**


Relamped by releasing latches; chain prevents dropping
Alzak aluminum reflector; 55 to 65 per cent more light on roadway
Lamp filament up in reflector; reduces glare
Deflectors (optional) shield houses; further increases light on roadway 25 per cent
Permanently sealed; no gaskets; dust-tight

# NEW *This* LOW-COST STREET LIGHT

## MORE LIGHT

55 to 65 per cent more light on the street than the most efficient, comparable luminaire now in use.

Incandescent lamp filament hidden from drivers.

Houses shielded from disturbing glare.

## LESS MAINTENANCE

Truly dust-tight – less cleaning.

Globe never removed from reflector – less glassware breakage.

Alzak aluminum reflector maintains high efficiency.

Few parts: (1) hood, (2) receptacle and socket, and (3) reflector and globe.

G-E salesmen have complete information and prices on this luminaire.

Call your nearest G-E office, or send in the coupon.

GENERAL ELECTRIC

## PRICE
### Of this new Luminaire

Form 79 (without deflector) . . $25.90 and up, list (GO-51)

Form 79A (with deflector) . . $33.40 and up, list (GO-51)

**MAIL THIS COUPON NOW**

General Electric, Dept. 6A-201, Schenectady, N. Y.

Please send me complete information and prices on the NEW G-E Novalux luminaires, Forms 79 and 79A (GEA-2276).

Name.....

Address.....

City..... State.....

500-164H

# Experience With Tamper-Proof Service

By E. E. KLINE
Superintendent Meter Department,
Union Gas & Electric Company,
Cincinnati, Ohio

With the advent of tamper-proof service entrance and metering equipment, new problems confront utility executives. They must decide to what extent and with what equipment their metering systems will be modernized. This calls for data on energy diversion conditions. But the extent of energy diversion and the possible increase in revenue by its reduction or elimination are difficult questions to answer with any degree of accuracy. The Union Gas & Electric Company in the last two years has conducted several investigations which have provided useful information on tampering conditions. One bit of information so obtained is that stoppage of tampering does not in every case mean increase in revenue. This fact appears with striking clearness in the accompanying table of energy uses of individual customers before and after installation of meter connection boxes.

The panels across the top of the tabulation show very satisfactory increases of metered energy following upon the installation of the boxes. But in the cases of the customers represented in the lower panels there is no improvement in revenue, and except for such benefit as may be assumed from the reduction of system losses, the effect of installing the boxes is more moral than financial.

## Stopping Energy Theft Does Not Always Mean Increasing Revenue

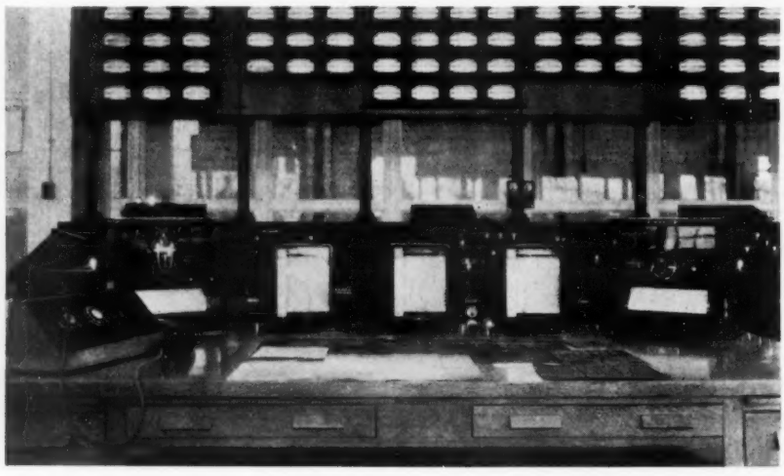
In the cases of these small commercial and residence customers installations of meter connection boxes resulted in increases of revenue.

| | Before Installation of Connection Box | | After Installation of Connection Box | |
|---|---|---|---|---|
| Customer | Readings | Average Kw.-Hr. | Readings | Average Kw.-Hr. |
| Shoe store | 5 | 95.2 | 10 | 438 |
| Clothing store | 5 | 129 | 11 | 592 |
| Beer garden | 7 | 327 | 5 | 858 |
| Medium residence | 8 | 22 | 8 | 96 |
| Small residence | 5 | 7.2 | 8 | 21.5 |
| Small residence | 5 | 5.2 | 5 | 42 |

But in these other cases little or no increases in revenue resulted, and the only benefit of meter box installation is the rather academic one of system loss reduction.

| | | | | |
|---|---|---|---|---|
| Gas station | 6 | 45.3 | 6 | 33.3 |
| Gas station | 6 | 136 | 7 | 179 |
| Garage | 5 | 123 | 7 | 159 |
| Small residence | 10 | 32.2 | 4 | 27 |
| Small residence | 5 | 33.6 | 6 | 23.3 |
| Small residence | 7 | 4 | 4 | 3.5 |

# Aids to Control of Frequency and Load

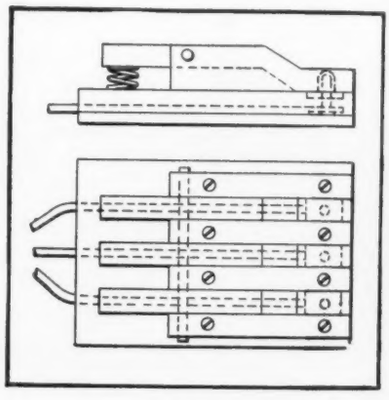


**Control of tie-line loads and system frequency at the Philo plant of the Ohio Power Company requires a major portion of the dispatcher's attention. The instruments which guide his actions are assembled around the edges of his desk where they may be easily seen**

From left to right they are: (1) the carrier-current telephone with which the operator keeps in touch with other dispatchers on the interconnected 132-kv. transmission system; (2) the frequency recorder with indicating lamps to show whether frequency is too high, too low, or in the normal range. (Since the photograph was taken the recorder has been modified and now gives a time deviation record also on the chart); (3) three graphic wattmeters showing loads on each of the double-circuit 132-kv. tie lines, and (4) the load-limit setter for the machines on automatic frequency control. In addition to load and frequency control, dispatching is supervised from this desk.

# Quick Connections for Motor Tests

When a motor rewinding job is finished the obvious next thing to do is to connect up and see if the motor will run. Since this is only a short-time, no-load test there is no need for particularly tight connections; it is satisfactory that the connections be solid enough not to pull out or rattle around. The main consideration in this regard is that the connections can be made and unmade quickly. However, the method of connection cannot be anything less than perfectly safe. How these requirements are met in the winding shop at Chevrolet plant No. 7 in Flint, Mich., is shown in the accompanying sketch.

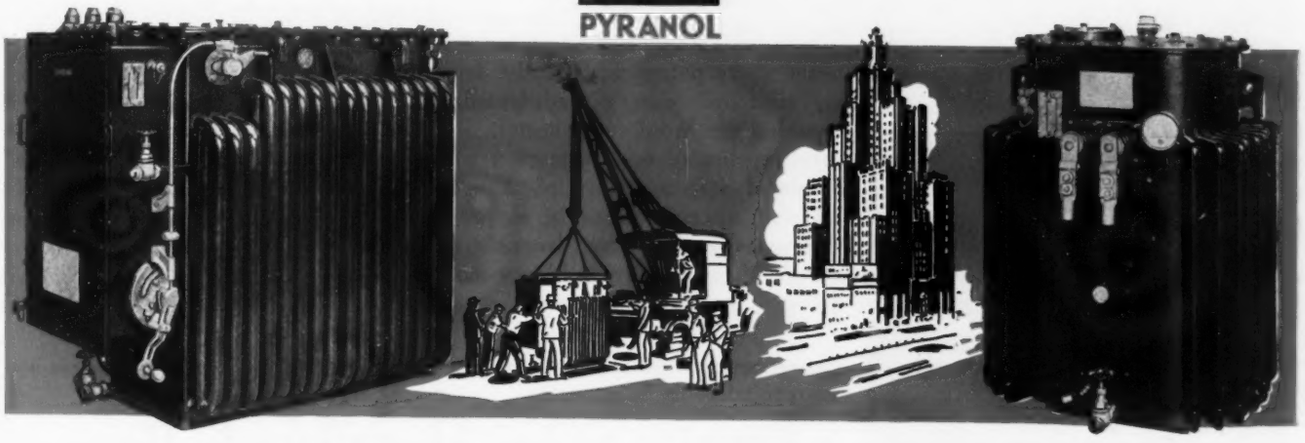


**Test connection for repaired motors**

The device is built up on a block of 1-in. fiber about 12 in. long and 8 in. wide. Screwed to the block are four spacers of the same material and between them are three fingers mounted on a cross-shaft so that the springs under the high ends hold the other ends tightly closed on the base block. Under the finger ends, which are countersunk to accommodate the holding studs, are copper-contact plates connected by the studs to the lugs on the ends of the three conductors which are carried through channels in the underside of the base block. The bottom of the base block is covered with a thinner plate of fiber. To connect a motor the spring fingers are raised and the lugs on the motor leads slipped on the studs. The fingers are then closed down by the springs and that is all there is to it.

# HOW G-E PYRANOL TRANSFORMERS Cut Total Installed Transformer Costs

THE 1935 revision of the National Electrical Code permits the installation of noninflammable, nonexplosive G-E Pyranol transformers indoors with many of the restrictions applying to oil-insulated transformer installations eliminated. In each of the applications pictured, G-E Pyranol transformers offer an opportunity for savings in total installed transformer cost. Complete information is contained in Bulletin GEA-2048, "G-E Pyranol Transformers." General Electric, Schenectady, N.Y.



**In Vaults**—under sidewalks, streets, or in buildings—such as are common in network systems, G-E Pyranol transformers afford savings because they are smaller. Thus they permit smaller, less expensive vaults, and less expensive methods of connecting the feeders.

**In Buildings**—apartments, offices, theaters, hotels, hospitals, and schools—savings are realized because expensive fireproof vaults are unnecessary for Pyranol transformers. A simple metal grill meets the reauirements of the National Electrical Code.

**Transportation**—in locomotives, railway cars, docks, and ships, G-E Pyranol transformers are particularly applicable since safety requirements can be met with minimum expense. Pyranol transformers for heating and lighting railway cars have been operating for more than three years with remarkable service records.

**In Industry**—savings are often possible, because Pyranol transformers can be installed immediately adjacent to the load, eliminating long runs of secondary copper and improving operating characteristics. Vaults are unnecessary; valuable floor space can be saved. Twenty-three per cent in total installed cost was saved in a recent installation.

300-31

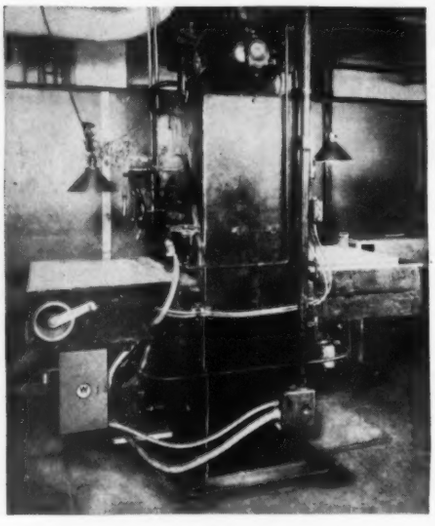
**GENERAL ELECTRIC**

# POWER AT WORK IN INDUSTRY

*New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers*

## Improved Mat Quality With Electric Heat

Electric immersion heaters generate the steam which heats the platens of a matrix press used to mold bakelite, celluloid and paper mats from which stereotype plates are cast at the Western Newspaper Union, New York City, to which electric service is supplied by the New York Edison Company,



**Immersion units generate steam for matrix press**

Inc. These units, which have a total capacity of 25 kw., are installed in both the upper and lower platens of the 800-ton press.

Temperatures up to 350 deg. F. are maintained at the platens by individual pressure controllers calibrated and set to maintain this temperature during operating and stand-by periods.

Combinations of hot molding and accurate temperature control made possible by the use of electric heat improve mat quality, shifting of the mat is prevented and perfect register for both single and multiple color work is obtained on the presses. Hot molding process required from two to seven minutes to mold and dry a matrix in one operation. For multi-color work from five to twenty minutes is required, depending upon the class of the work produced. This constitutes a marked saving in time over the old processes.

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## Potatoes Dried by 9-Kw. Space Heaters

By FRED CLAYTON
Nashville, Tenn.

Surplus energy was available at a plant where potatoes had to be dried, so electrical energy supplanted a troublesome wood-fuel heater. To save expense of transformers a well-insulated star assembly of 220-volt, 500-watt space heaters in six-series, three-parallel was served from the terminals of the 2,300-volt, blower-motor through porcelain disconnects.

The strips (24x2 in.) were fastened with stove bolts to two pieces of ebony-asbestos-wood, all in a horizontal edgewise position, each strip having its support and sheet iron sheath insulated apart and from ground by means of the asbestos-wood, forming a grid through which air circulated freely. The whole assembled fabrication was supported just inside of the blower suction hood which extended nearly to the small room ceiling, the hood being in a rectangular shape for the purpose of making air flow in easily all around the strips.

Eighteen strips were placed six in series between the phase supply lines and a neutral point, forming a complete star-connected unit. This impressed slightly higher voltage than

## Power Sales Handbook Begun

**Data Sheet Series to Serve Power Sales Engineers and Electrical Engineers in Industries That Should Be Using More Electrical Equipment**

POWER sales engineers have learned that they are at a disadvantage in their efforts to make the benefits of electrical methods appeal to industry as long as they are unfamiliar with the process requirements in those industries. Several of the larger utilities have started to correct that deficiency by preparing industry flowsheets and process-literature for their staffs. It has proved a slow and costly task for individual companies to undertake.

ELECTRICAL WORLD inaugurates in this issue a series of data sheets that will contribute to the needs of power sales engineers in this respect. They will be prepared in collaboration with the power industry and by consultation with the particular industries served by it as their turn comes in the series. The data will show:

1. The sequence of process operations of the particular industry.
2. The spots where motors, control, heat, refrigeration and air conditioning are appropriate aids to those process functions.
3. Who are the principal makers of machinery for each industry.
4. Its rating electrically, correlated with its own production rating.
5. What the technical requirements in those process steps are in so far as they point to electrical ways of improving upon results.
6. Characteristic energy consumptions.

Nearly every town has its bakery so the bakery data sheets open the series. Laundries will probably follow and then will come other power-using industries that are widely diffused throughout the country.

Our industrial readers will also find these data sheets of great interest and value. Industry is busy with modernizing movements in which the latest ideas and equipment are being used, and these, in general, are electrical. The data on equipment and processes should permit industrial electrical engineers to know and to apply new methods and new information.

**[First installment appears on page 58]**

called for, but was desirable for the capacity.

Because of the chance of the belt coming off, the following precautions against overheating were taken:

1. One-sixteenth-inch sheet iron was supported a few inches above the heater assembly, thus shielding the room ceiling.
2. String or wire fuse was interposed in the circuit just above the heater assembly, so that if blower stopped carrying off the heated air from any cause in a few seconds these string fuses melted, opening the circuit.

These string fuses were supported high enough so if they sagged or hung down they could not reach the strips.

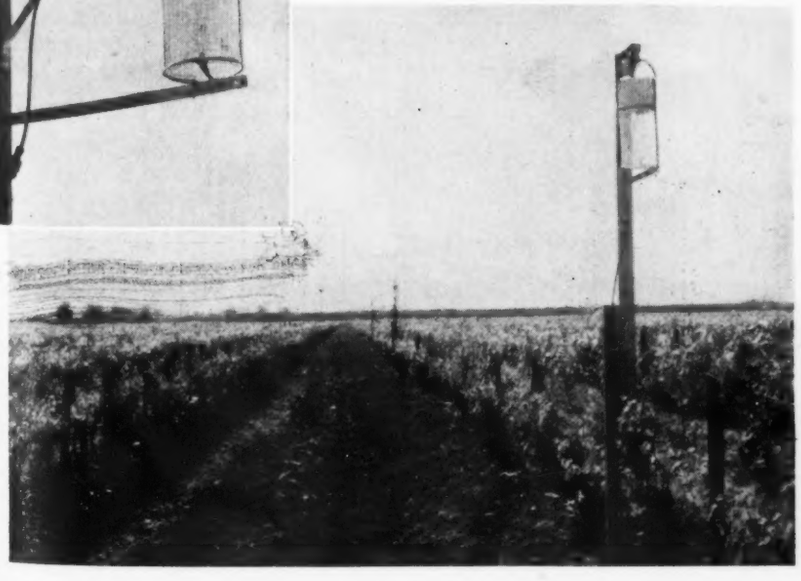
•

# Insect Traps Benefit Agriculture

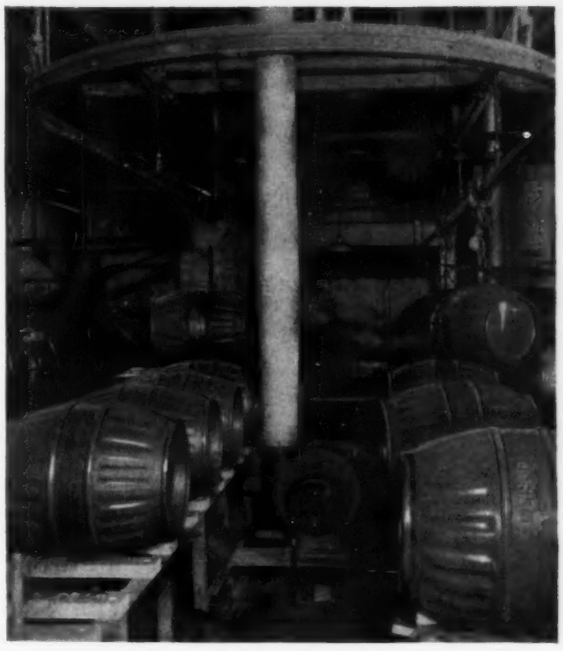
Investigations conducted at the University of California on insect control by means of electrocuting traps promise increasing relief for the farmer from losses due to pest infestation of his crops. Experience indicates that various colored lights used to attract different species of insects to the traps greatly add to the efficacy of this method of control. For example, a midnight blue gaseous tube in the trap was most effective in killing grapeleaf hoppers, 88 per cent of the insects attracted to the traps being females. In this installation one trap per acre provided the best insect control.

For the control of the artichoke plume moth the electric trap proved very effective in reducing the infestation from a general average of 25 to 30 per cent to from 3 to 5 per cent. Strict regulation by food authorities of the use of poisonous sprays on fruit and vegetables are forcing the farmer to turn to other methods of pest control, the most promising of which seems to be the electrocuting traps.

Utilities in the rural areas are giving greater attention to familiarizing the farmers with the possibilities of these insect traps. In a recent campaign the San Joaquin Light & Power Corporation aided in placing several experimental installations in the fields of central California. While the insect trap is not a particularly good energy-consuming device, particularly those equipped with gaseous tube lights, it has proved a splendid means of convincing the farmer of the value of electric service on the farm.



**General view of the electrocuting insect traps in a California vineyard (below). Close-up of the trap showing the gaseous tube light source and the service from a cable buried in the field (left)**



**Electrically driven blower dries steel keg interiors**

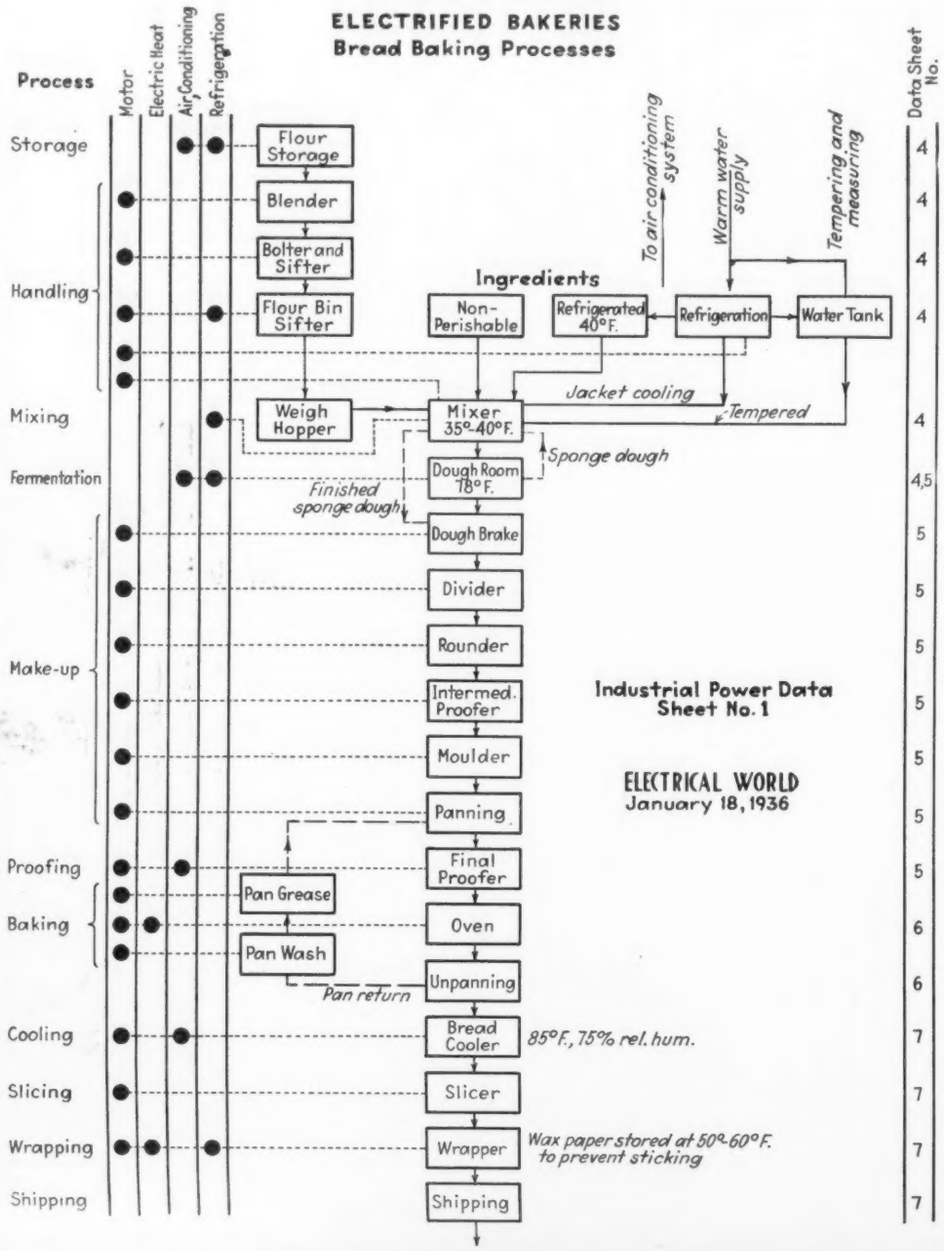
Vapors exhausted through roof. Overhead monorail conveys kegs from lacquer booth to drying frame and from drying frame to baking oven at Truscon Steel's pressed steel division, Cleveland.

# Blower Removes Keg Lacquer Vapor

In the manufacture of steel beer kegs one of the problems met and solved was that of exhausting the lacquer vapor from the keg interior and rapidly air-drying it before baking. The inside coating—a special lacquer—serves as a base for a subsequent covering of pitch. When the air within the keg is saturated with vapor the lacquer evaporates so rapidy that bubbles develop and frequently crack the inner coating. It was, therefore, imperative to exhaust the lacquer vapors and give the inner coating an air-drying before the kegs were baked.

Parallel sets of wooden racks were constructed, each capable of supporting ten kegs. Between these racks was placed a standard blower, driven by a ¾-hp. motor. With the blower exhausting to a stack, its intake side was connected to ducts beneath each of the racks, from which individual vacuum lines branch to the bunghole positions in the kegs.

When a keg has been sprayed and the excess lacquer drained by gravity an over-head monorail conveyor swings it onto the rack and opposite a 1-in. nozzle, which is then inserted in the bunghole. A few minutes' operation of the blower is sufficient to draw air and vapor from the kegs and thoroughly air dry their interiors, after which they can be satisfactorily baked, outside and inside, at 300 deg. F. for 45 minutes.




# ELECTRIFIED BAKERIES

## Customary Equipment

Amount of electrically operated equipment that can be used advantageously depends, of course, on the output. Approximate requirements can be gaged by the following outlines:

*Large Wholesale Bakery.* One producing 3,000 to 4,000 loaves of bread per hour and correspondingly large quantities of sweet goods:

| | | | |
|---|---|---|---|
| Dump Bin | Rounder | Depositor | Lye Solution Boiler |
| Blender | Proofer | Cake Cutter | Steam Generator |
| Bolter | Moulder | Icing and Topping Machine | Elevator |
| Conveyor | Oven | Bun and Roll Divider | Gas Booster |
| Sack Cleaner | Bread Cooler | Doughnut Machine | Fuel Stoker |
| Dough Mixer | Bread Slicer | Fry Kettle | Pan Washer |
| Trough Hoist | Wrapping Machine | Pretzel Dough Mixer | Ventilating Equipment |
| Dough Brake | Air Conditioning | | Hot Plate |
| Divider | Refrigeration | | |
| | Batter Mixer | | |

*Smaller Wholesale Bakery:*

| | | |
|---|---|---|
| Dump Bin | Combination Make-up Unit (Dough Brake, Divider. Rounder, Proofer, Moulder) | Bun and Roll Divider |
| Blender | | Refrigeration |
| Bolter | | Slicing Machine |
| Conveyor | Oven | Wrapping Machine |
| Dough Mixer | Fry Kettle | Ventilating Equipment |

*Small Retail Bakery.* Producing a few hundred loaves a day and a correpondingly small amount of sweet goods:

| | | |
|---|---|---|
| Dough Mixer | Fry Kettle | Ventilating Fan |
| Oven | Refrigeration | |

## Bakery Classifications

1. Breads—white, rye, graham, whole wheat, rolls, etc.
2. Sweet Goods—cakes, cookies, doughnuts, sweet buns, pies, etc.
3. Crackers and Biscuits—soda crackers, ginger snaps, package goods, etc.
4. Pretzels and miscellaneous specialties.

## Functions of Bread Ingredients

*Flour:* Foundation and major constituent of bread and rolls. Flours are usually blended to compensate for differences in type, grade, region of growth, time of sowing (spring or winter wheat), color, flavor, strengthening effect on gluten, elasticity of gluten.

*Water:* Determines dough consistency, makes gluten formation possible, dissolves salts, swells the starch and makes bread more palatable.

*Yeast:* Raises dough, develops flavor and supplies vitamins.

*Milk:* Adds food value, tightens dough, improves keeping quality and flavor.

*Sugar:* Source of carbohydrate food for yeast, adds taste, gives color to crust.

*Malt Extract:* Supplies yeast food, crust color, preservative, palatability.

*Shortening:* Gives flaky crumb, tender crust, better texture, food value, richness, flavor, palatability.

With today's increased loads on power plants, such as shown here, engineers are checking their equipment carefully to assure maximum efficiency. Turbine lubricants of highest uniform quality are needed to insure continuous, trouble-free operation.

# GULFCREST

## The ONLY ALCHLOR PROCESSED TURBINE OIL

## Gulf Offers Power Plant Operators the Most Stable Turbine Lubricant Obtainable

"GULFCREST is the finest turbine oil we know how to make"—that is the statement of Gulf's large staff of technicians and refinery experts.

For Gulfcrest is the only turbine lubricant treated by the ALCHLOR Process. This famous process—exclusively Gulf's—permits the manufacture of a more stable turbine oil than is possible by any other process yet developed.

That is why Gulfcrest oil has the highest resistance to oxidation and to the formation of acidity and sludge. The performance records of this oil in turbine systems of leading power plants are unparalleled. It is the safest and most economical turbine lubricant you can buy.

**GULF REFINING COMPANY, PITTSBURGH, PA.**

GULF INDUSTRIAL LUBRICATION

*District Sales Offices:* Boston · New York · Philadelphia · Atlanta · New Orleans · Houston · Pittsburgh · Louisville · Toledo

## 4 REASONS why Gulfcrest Oil is the Turbine Lubricant of Unparalleled Quality

1 *Refined by the ALCHLOR Process.* This famous process, patented and owned exclusively by Gulf, is the most thorough and effective method for removing chemically active hydrocarbons as well as the general run of impurities present in all crudes.

2 *Highest resistance to oxidation.* Because this famous ALCHLOR Process synthesizes and rearranges the molecular structure of certain hydrocarbons, resulting in a finished product of greater stability, GULFCREST OIL stands alone in its high resistance to oxidation.

3 *Highest resistance to acidity and sludge.* Because of the elimination of oxidation catalysts in addition to the unparalleled refining power of the Alchlor Process, these oils form less gum and deposits, less emulsion and sludge, when mixed with water over a period of several years continuous operation, than any other turbine oil of which we have record.

4 *Highest kilowatt-hour performance.* Because Alchlor not only makes possible an oil more thoroughly refined and homogeneous but also creates antioxidants, these oils have great resistance to deteriorating influences and are longer lived. Less makeup oil is required.

GULF REFINING COMPANY, EW-1
3800 Gulf Building, Pittsburgh, Pa.

Please give me complete information regarding Gulfcrest Oil.

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# NEW ENGINEERING IDEAS

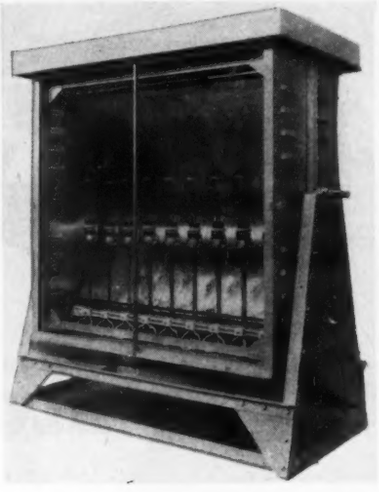
***Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory***

## Europe Abandoning "Flat" Floodlighting

By A. L. POWELL
Supervising Engineer, Incandescent Lamp Dept., General Electric Company, New York

Very often architects justly complain that floodlighting destroys the beauty of a structure because of distorted shadows and a flat effect produced by light emanating from a large number of units. The firm of Claude Paz et Silva, Paris, sensing this, has developed a parabolic trough reflector capable of containing a number of high wattage lamps and has aptly named this a panoramic projector. Placing this high-powered unit at a strategic point a large area can be illuminated with most interesting shadow effects.

The marketplace in Brussels is skillfully illuminated by a single projector using fifteen 1,000-watt lamps placed on the roof of one of the buildings at the west end of the square. The play of high-lights and shadows is certainly worthy of praise. Some idea of the effect of light emanating from a single high-powered source can be had from the accompanying illustrations, one showing the portal of the cathedral at Rheims. The panoramic projector produces deep, strong shadows and brilliant high-lights. Another example of the single projector for lighting an extended area is given in the ruins of the Roman Forum, strikingly visible after nightfall.



**Floodlight concentrates nine 1-kw. bulbs in parabolic source called panoramic projector**

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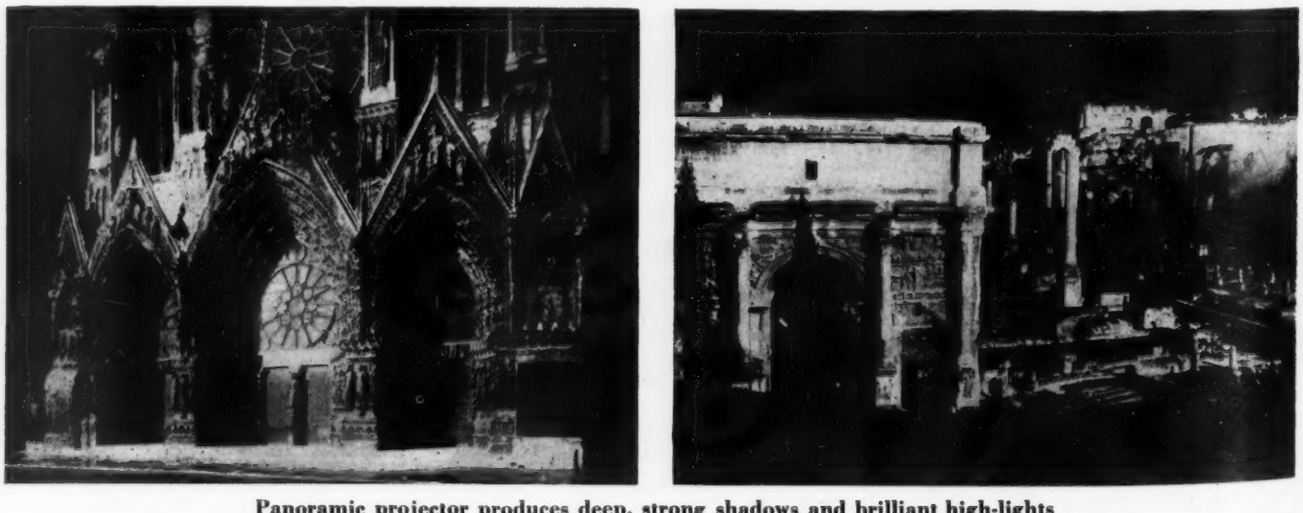
## Dielectric Value and Strength Related

A series of investigations undertaken to determine the relation and correlation between the electrical and mechanical properties of porcelain furnished by manufacturers of high-voltage insulators were conducted recently by the Engineering Experiment Station of the University of Illinois in co-operation with the Utilities Research Commission of Chicago.

Results of these investigations show that there then exists a marked relationship between mechanical and electrical strength of specimens. Specimens subjected to electrical stress while under compression followed a definite law of performance. Breakdown voltage from zero to the maximum load studied increased until about 15 per cent of the ultimate load strength was reached, when a reversal occurred and the voltage fell off. Microscopic study of the electrical puncture track definitely indicated the electrical strength of the material. Straight puncture paths were said to indicate high dielectric strength, while curved and scattered puncture paths indicate correspondingly lower dielectric strength.

In general, it was stated that dielectric strength studies are merely studies of the presence of flaws, since breakdown is generally through some defect in material, apparent when the specimen is opened at the puncture track. These flaws are not produced by the passage of current through the section, it was stated. At the present state of development of porcelain it may be said that dielectric strength tests are merely a check on the manufacturing processes. A comparatively perfect porcelain should give many times the



**Panoramic projector produces deep, strong shadows and brilliant high-lights**
Two of Europe's famous posts given life by new trend in floodlighting. Left—Rheims restored cathedral. Right—Rome's Forum.

# HERE'S THE VOICE OF EXPERIENCE...

## discussing the most effective way to stop Energy Diversion

*"The full benefits of new sequence metering will be realized only if a strict and rigid enforcement of sealing is maintained."*

*Excerpt from an article in Electrical World (October 12th, 1935) by E. E. Kline, Superintendent Electric Meters, Union Gas and Electric Company, Cincinnati, Ohio.*

Installation of the most advanced metering devices to protect your revenue is logical. Using a seal which is not tamperproof is obviously taking chances. Install the tamperproof Murray Padlock Seal—and you obtain the proved most effective means of detecting and combating current diversion. Why not act on the experience of hundreds of satisfied users? Write today—tell us the number of seals used yearly—we'll submit samples and quote prices.

LOOK FOR THE NAME
MURRAY

MURRAY METERING DEVICES
METER CONNECTION BOXES
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METROPOLITAN DEVICE CORP.
1250 Atlantic Avenue
BROOKLYN, NEW YORK

# MURRAY PADLOCK SEAL

dielectric strength of the commercial porcelain available at present, it was declared.

•

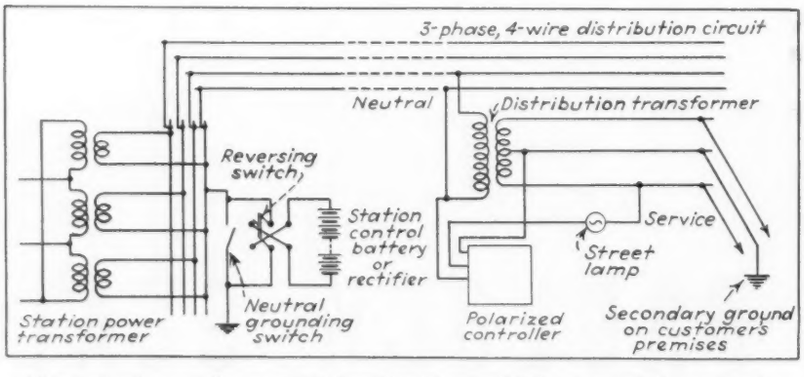
# Control Street Light Over Primary Circuit

A new polarized control system for regulating the operation of multiple street lights and off-peak services utilizes directional d.c. impulses, sent out over primary distribution neutral or special pilot wire, to actuate polarized relays at each street light. These relays open or close the street light circuit, depending upon the direction of the control impulse.

After the neutral grounding switch at the control station has been opened a negative impulse from the station battery or rectifier is sent out over the primary neutral to the polarized controllers. This control impulse moves the armatures to the left-hand position, closing the circuit of the street lights and connecting them to the secondary network. The actuating impulse returns to the station through the grounded neutral of the distribution secondary. To remove the lamps from service a positive impulse is sent over the neutral, moving the armature in the opposite direction and opening the lamp circuit contacts.

In cases where it is not desirable to leave the station neutral ungrounded a resistor of adequate capacity may be connected across the grounding switch. All polarized controllers are provided with a choke of sufficient size to eliminate residual alternating currents and to prevent stray operation from lightning disturbances.

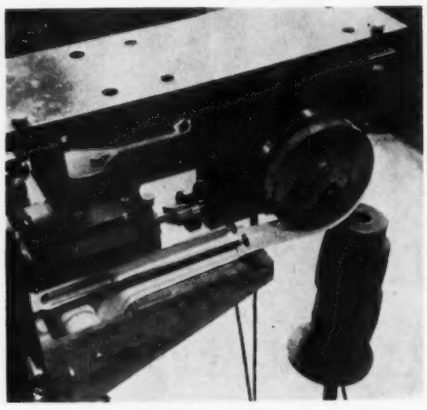
In cases where three-phase, four-wire distribution is not available and three-phase, three-wire is standard a pilot wire of small size can be used to carry the control current.




**Neutral wire carries control impulse for multiple street light control**
Shown for three-phase, four-wire primary distribution circuit

# Fork Measures Time of Hoist Travel

By C. B. CONNELL
Gearing Engineering Department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.



**Tuning fork graphs travel time in hoist test**

Confronted with the problem of designing an inexpensive recording device for testing several special hoisting drives made to hoist a load a given distance in a fractional part of one second, the following method was devised to time the travel:

Employ a 10-in., 60-cycle tuning fork, on which is placed an ordinary Eversharp pencil lead beneath one of the screw heads. A wooden disk of the same diameter as the hoisting drum is then bolted to the drum. A roll of ordinary adding machine paper is then connected to the wooden drum by means of a thumb tack. The recording paper roll is mounted on an axle pin, which in turn is supported by a wooden frame. The wooden frame must have a flat surface for the paper to pass over and be of a length slightly beyond the end of the tuning fork and a width slightly wider than the recording paper.

The tuning fork is mounted on a substantial framework, approximately 2 in. above the paper, to obtain best results. A flat piece of steel is placed under the paper a slight distance from the pencil to obtain the proper resilient pressure of the lead on the paper. The tuning fork is started to vibrate by hand just before the hoisting drive is started to operate.

As the hoisting drum revolves the paper is drawn between the pencil point and the support. The lead records on the paper the number of vibrations during cycle of operation. The number of vibrations that occur in a measured distance can then be counted.

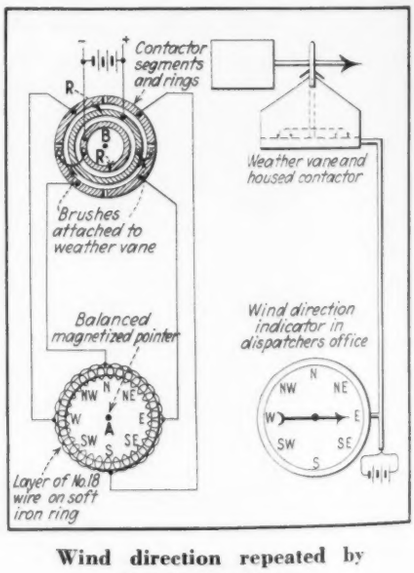
The distance traveled in the accompanying illustration was approximately 6 in. in one record.

•

# Electrical Wind Direction Indicator

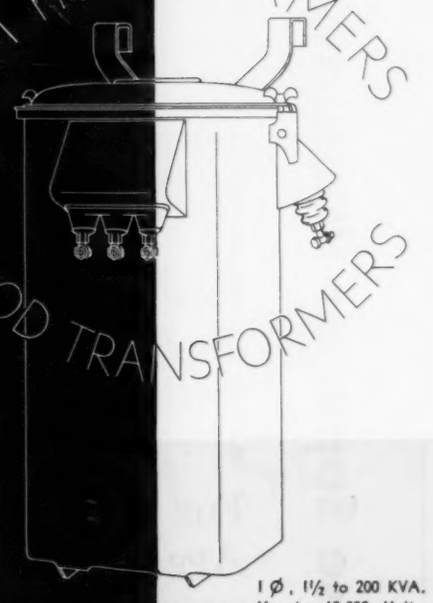
By A. P. BROADHEAD
Dispatchers Institute, Oneonta, N. Y.

In use at this school is a master weathervane with remote electrical indication that serves to afford correlation of weather conditions with operating technique. The scheme lends itself well to multiple indications from one master. Each of the four major points of the compass is represented by a quadrant tap on an endless toroidal coil. Intermediate positions are derived from the degree of brush overlap on the four corresponding segments over which the weathervane swings as wind changes. Up to 200 ft. No. 10 copper conductors suffice and for longer distances or more indicators the wire may be larger or more cells used.




**Wind direction repeated by electrical indicator**

LOWERING L-M TRANSFORMER COILS INTO TREATING TANK




1 Ø, 1½ to 200 KVA.
Up to 13,800 Volts.

# L-M TRANSFORMER COILS ARE CAREFULLY DRIED and IMPREGNATED!

All L-M Transformer coils are dried in heating tanks at atmospheric pressure for a definite time. They are then subjected to a 28-inch vacuum for a certain number of hours. This treatment removes all moisture from the cotton and paper insulation in the coils.

The coils are then impregnated with an oil-proof compound under pressure which improves the dielectric strength and prevents entrance of moisture, transformers' greatest enemy.

Temperatures and pressures throughout the process are controlled by latest type automatic recording and regulating instruments and equipment.

*One reason why "L-M TRANSFORMERS ARE BETTER TRANSFORMERS."*

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These Superior Products will Fit Your Needs:

- FOR DIVERSION PREVENTION
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  *use Superior Test Switches and Blocks*
- FOR ENCLOSING ELECTRICAL APPARATUS
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*The* SUPERIOR SWITCHBOARD *and* DEVICES COMPANY . *Canton, Ohio*

*Been at it Since 1920

SUPERIOR
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## Westinghouse 50 Years Old

[*Continued from page 37*]

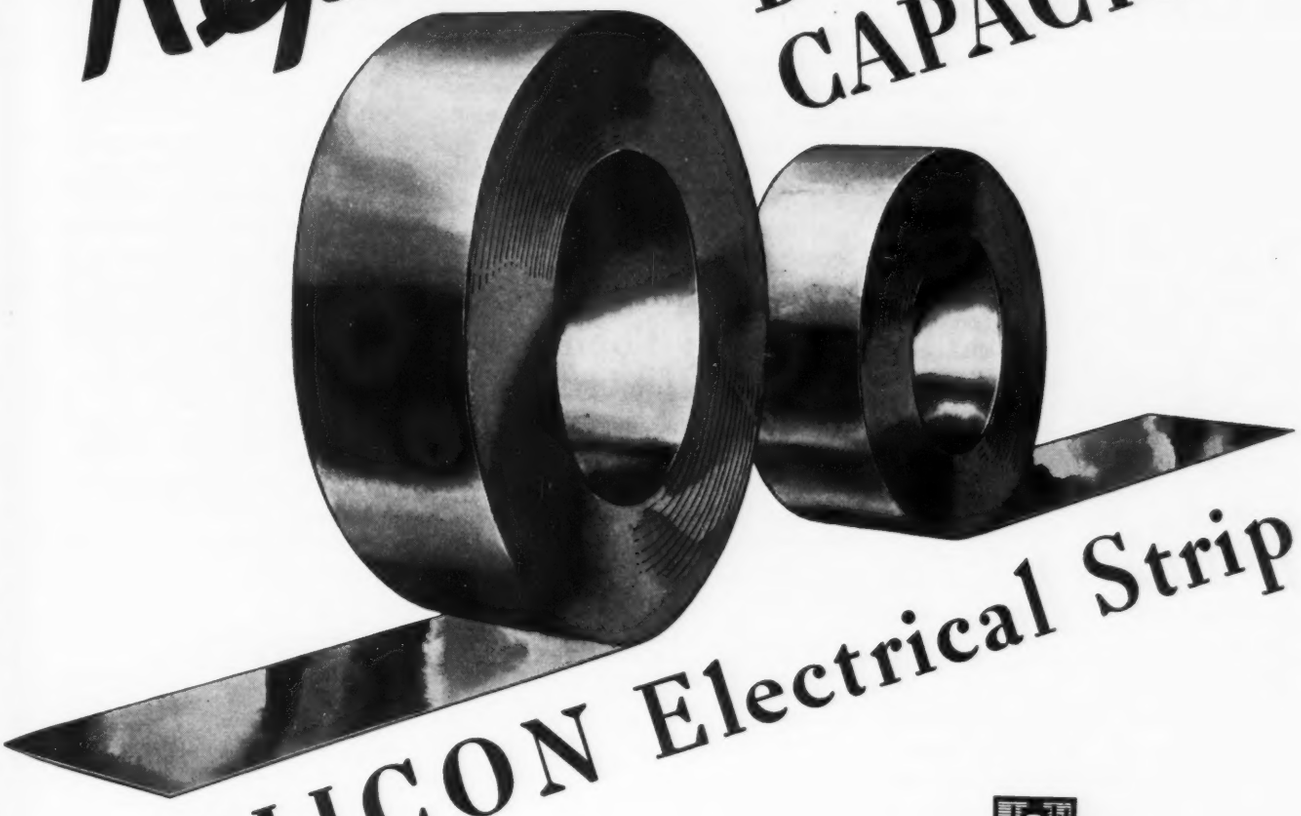
pay a substantial amount of wages as a type of unemployment compensation.

"The company begins its fiftieth year with universally satisfied customers. It has sales forces wherever its customers may be—all over the United States, Mexico, the countries of South America, South Africa, Europe, India, Palestine, China, Japan, Australia. The name Westinghouse is known and respected in Russia. Great industries in England, France, Spain and elsewhere pay the Westinghouse company large sums annually for the privilege of using its knowledge in their own factories. This is an honor and a recognition of Westinghouse prestige enjoyed by few other companies.

"The Westinghouse organization must compete with other organizations created and manned by capable human beings. The business of the world is divided up between the companies which, in the long run, serve best. In other words, the company that has the best product, the best service and the best sales force gets the most business over a period of time. Business, in a sense, is a battle of brains. The weak pass out. Only the fit, the worthwhile, the able, survive. Westinghouse has survived for more than two generations because it deserved to survive, and for no other reason. The company has served the world well and the world has rewarded it well. The past is an open book. We of the present read it with pride and with due respect for the accomplishments of the past. The future lies before us, unknown. The destiny of the Westinghouse Electric & Manufacturing Company is now in our hands. If the past history was great, it was great because the men of Westinghouse were great men. If we have a great future, it will be for the same reason: namely, that the men of Westinghouse are great men. They must have courage, industry and foresight superior to their competitors or the company will not be superior.

"It is useless to point to the past with pride. The key of the past will not open the door of the future, but continued application of courage, enthusiasm and foresight will carry Westinghouse to heights beyond our imagination. Westinghouse men have raised the banner of the Westinghouse company high. It is our duty and privilege to keep it high."

# Republic DOUBLES CAPACITY for SILICON Electrical Strip



REPUBLIC STEEL

Additional annealing facilities have recently been placed in operation, more than doubling Republic's capacity for the production of silicon electrical steels in coiled strip.

Uniform quality, low core loss, high permeability, freedom from loose scale—these are the factors that have resulted in the growing demand for Republic Silicon Electrical Steels—the steels that give better electrical performance and lengthen the life of punches and dies.

These steels are made in coiled strip with all coil set removed, and in sheet form. Five standard grades are available—Armature, Electrical, Special Motor, Special Dynamo and Regular Transformer.

Let us tell you why Republic Silicon Electrical Steels will speed up production, lower costs and improve your products. Full information on request.

Republic Steel
CORPORATION
GENERAL OFFICES . . . CLEVELAND, OHIO

# BUILDING UP THE LOAD

***New ideas and practices in selling electrical equipment and service to industrial, commercial and domestic customers***

## Bulk Usage the Key to Low Home Rates

Although it is no longer news that promotional rates stimulate domestic use of electricity and bring down average prices per kilowatt-hour, Hartford's recent experience with its "free energy" plan is both interesting and significant. Eleven months ago the company offered 50 free kw.-hr. for an increase of 10 in monthly consumption over the corresponding period of 1934. This "share-the-benefit" plan, as Mr. Ferguson termed it, has met with wide acceptance, some 30,000 customers (nearly half the total on the system) having added to their usage. In October 437,000 kw.-hr. was furnished free, and the average consumption per residential customer has now reached 960 kw.-hr. per year. An objective of 1,200 kw.-hr. by 1937 has been set, and substantial rate reductions announced to begin December 1 of this year. The total credits on all classes of business for increased consumption now amount to about a quarter of a million dollars per year, and the average rate has fallen in fifteen years from 8.5 cents to 4.02 cents.

Nor is this the whole story. The bulk of the energy required for various home comforts will now be available at less than 3 cents per kilowatt-hour. Mr. Ferguson points out that this compares favorably with the much-exploited rates of the T.V.A. for household service. This will be accomplished without any so-called "developmental" surcharge on commercial and industrial business such as obtains in the governmental project, and indeed without any other subsidies or politico-economic perquisites in the form of postage concessions, railroad rebates or other "discounts" which have bent the famous "yardstick" decidedly out of shape.

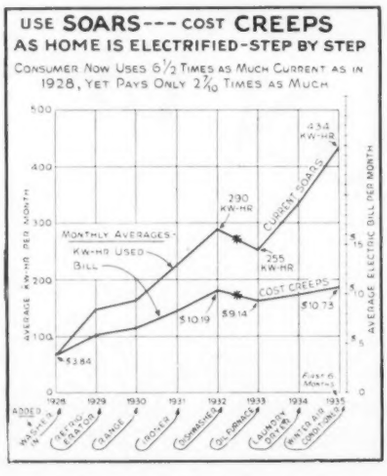
The Hartford Electric Light Company, and not a few other utilities as well, are on their way toward a level of usage and a plan of electric service billing which should produce a decided calm in the political winds once the public realizes the cheapness of residential kilowatt-hours when used in good volume. This means a rising market for heavy-duty home appliances, and it is fair to say that the more vigorous the load-building program of power utilities the country over, the sooner politicians will run short of ammunition against rates.

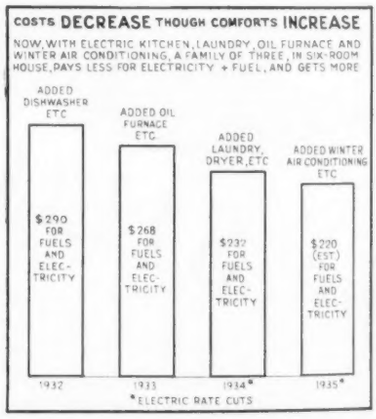
•

## How Appliances Will Buy Themselves

The effect of a progressive electrical equipment in the home on the cost of living has been worked out in interesting detail by C. M. Ripley of the General Electric Company in his home in Schenectady. The accompanying charts and table show the effect of a planned program of electrification in which the benefits of a promotional rate and the economies provided by each successive appliance have been applied to the purchase of the next piece of equipment desired.

In the process the cost of ice, gas, coal, a washerwoman and considerable food spoilage was eliminated, step by step, and the saving applied to the purchase of the larger consumption of electricity and to the payments on the additional equipment. Mr. Ripley's home contains close onto 50 electrical appliances, but he figures that the entire investment, excluding the oil burner, has practically been paid for by the savings it has brought and that his present complete, modern equipment, including refrigerator, range, dishwasher, sink and all, has been secured as a reward of careful planning.





COSTS DECREASE THOUGH COMFORTS INCREASE
NOW, WITH ELECTRIC KITCHEN, LAUNDRY, OIL FURNACE AND WINTER AIR CONDITIONING, A FAMILY OF THREE, IN SIX-ROOM HOUSE, PAYS LESS FOR ELECTRICITY + FUEL, AND GETS MORE
ADDED DISHWASHER ETC
ADDED OIL FURNACE ETC
ADDED LAUNDRY, DRYER, ETC
ADDED WINTER AIR CONDITIONING ETC
$290 FOR FUELS AND ELEC-TRICITY
$268 FOR FUELS AND ELEC-TRICITY
$232 FOR FUELS AND ELEC-TRICITY
$220 (EST) FOR FUELS AND ELEC-TRICITY
1932
1933
1934*
1935*
*ELECTRIC RATE CUTS

*Drop in curves in left-hand chart due to abandonment of 3 space heaters no longer needed.

**Cumulative effect of increasing appliance use over period of years**

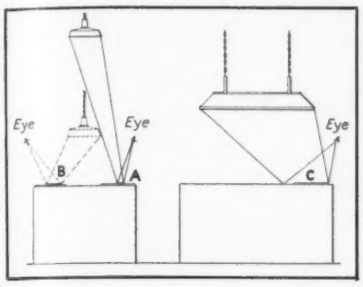
### Record of Principal "Engineering" Expenses in 6-Room Home

before, during and after complete electrification (three in family)

| Year | Cost | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ice | Gas | Coal | Oil | Electricity | Per Year Total | Average Per Month |
| 1928 | $30 | $37 | $140 | $0 | $46 | $253 | $21.09 |
| 1929 | 24 | 35 | 150 | 0 | 69 | 278 | 23.20 |
| 1930 | 0 | 31 | 140 | 0 | 74 | 248 | 20.40 |
| 1931 | 0 | 29 | 149 | 0 | 98 | 276 | 23.00 |
| 1932 | 0 | 28 | 140 | 0 | 122 | 290 | 23.20 |
| 1933 | 0 | 28 | 131 | 0 | 109 | 268 | 22.30 |
| 1934 | 0 | 0 | 0 | 115 | 117* | 232 | 19.35 |
| 1935 | 0 | 0 | 0 | 101 | 109* | 220 | 18.30 |

*Rate cut each year.

## New Lighting for Imposing Table




In a lecture recently presented several times to printers at the Chicago Lighting Institute the accompanying diagrams were used to indicate common methods of lighting imposing stones and a way to improve greatly the illumination. The improved method incorporates an extremely large area light source that avoids any dark areas.

•

## Towns to Compete for Electrical Eminence

Rewards to towns instead of sales staffs is the novel and unusual feature of a new load-building competition among towns in Georgia. Prizes totaling $10,000 to be used for civic, charitable or educational purposes have been set up by the Georgia Power Company to find which are "Georgia's Champion Home Towns."

Awards in the contest will go to the towns showing the most favorable increase in the average residential kilowatt-hour consumption over a twelve-month period. Under the system of scoring contest points, towns already having high averages and in which increases may be slower are not handicapped, nor are towns having low averages at the beginning of the contest penalized. The system is designed to equalize the winning chances of all towns in the contest.

This "Home Town Electrical Contest" will be conducted among the incorporated cities and towns, and served directly by the Georgia Power Company, which have 25 or more residential customers. Because large increases in electrical consumption by individual customers would have a disproportionate effect upon a small town's average by comparison with larger towns, all eligible towns have been placed in one of four classifications, depending on the number of customers.

Uses to which the prize awards may be put by the winning towns will be determined by committees of local citizens. No limitations will be placed except that the money be expended for civic, charitable or educational purposes, civic improvement or civic betterment.

•

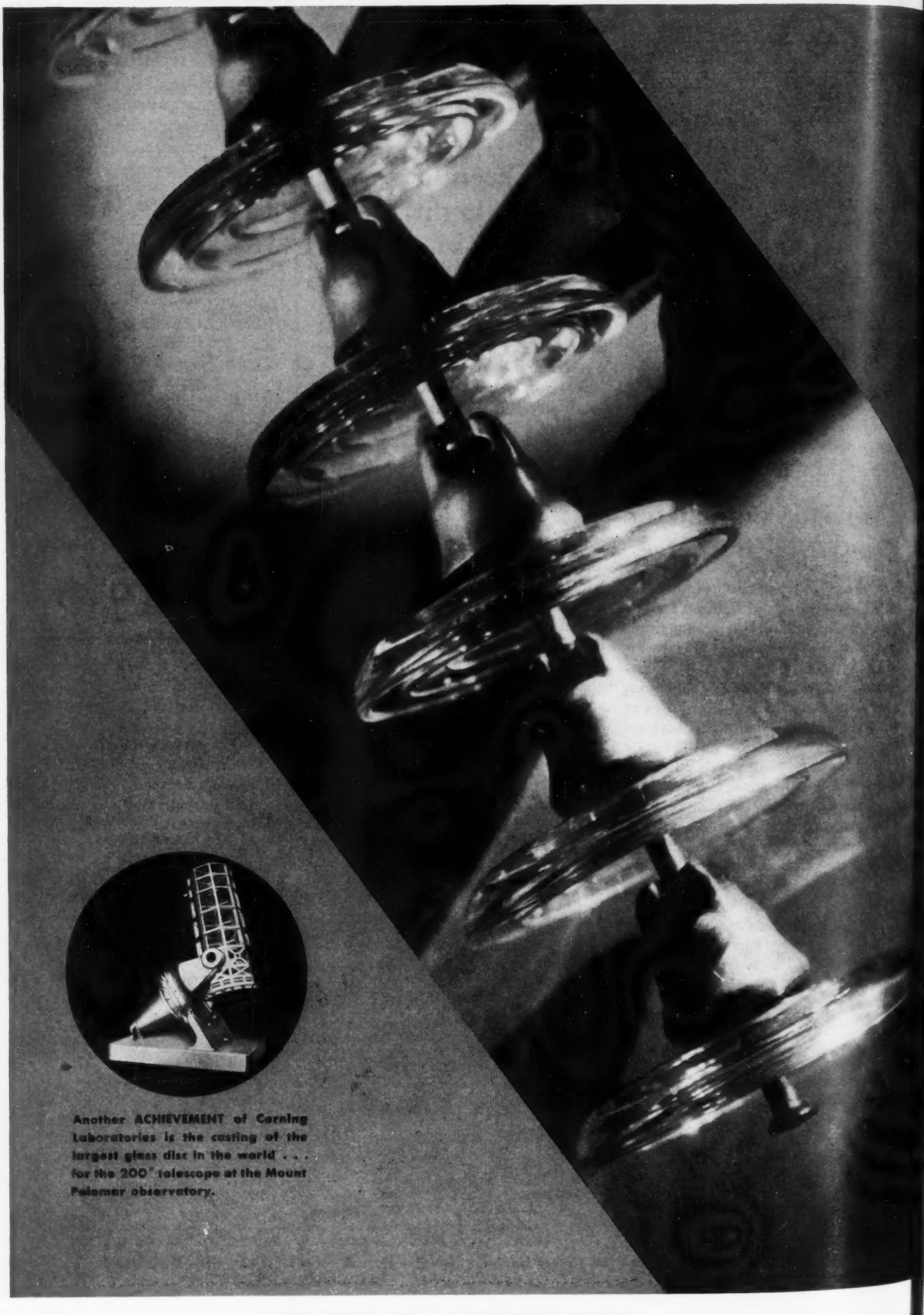
## New Greenhouse Electric Light, Heat

Experiments at Nela Park and the Boyce Thompson Institute at Yonkers have developed interesting possibilities in a new type of greenhouse for plant propagation. Instead of the usual glass structure, the house is built like a refrigerator, completely insulated, except for an airtight window on the south side. Light and heat are supplied by a battery of "Mazda" lamps in R.L.M. reflectors that can be raised or lowered to accommodate the growth of plants. Heat is regulated by a thermostat. This greenhouse has been operated since November and brought various types of plants to flower in one-third the time of ordinary greenhouses and at a cost which seems to offer opportunities for commercial adoption of this controlled heat and light process.

Standard greenhouse construction is glaringly inefficient in its waste of heat and the economy of the new structure seems to justify the abandonment of steam heating and total reliance upon electric light and heat. The lamps burn only on cloudy days and at night, the length of time depending on the outside temperature. The total burning averages about four hours a night and a far better control of humidity and carbon dioxide concentration is provided. With this construction greenhouses can be built vertically and save expensive ground area. For both private and commercial use the idea holds promise of important off-peak load for the power company.

**NINE ADVANTAGES of the electric range are presented with a simple attention-compelling directness in this poster which the Electric Institute of Washington, D. C., is sending to its members with the recommendation that every range salesman make it part of his electric range portfolio.**

**Novel insulated greenhouse with electric light and heat brings flowers in one-third less time**



Another ACHIEVEMENT of Corning Laboratories is the casting of the largest glass disc in the world . . . for the 200" telescope at the Mount Palomar observatory.

# Methuselah of Materials

WHAT characteristics insure long life for insulators?
One may properly say: "If a material having proper insulating values is found . . . a material that DOES NOT DETERIORATE, then you have a long lived insulator."
The PYREX Brand glass used in the manufacture of insulators assures long life and maximum thermal resistance at all times.
These thermal characteristics enable the insulator to withstand power arcs of great magnitude without shattering . . . and sudden temperature changes.
And in addition, the TRANSPARENCY of PYREX insulators prevents their overheating in sunlight . . . and the temperatures attained are uniform top and underside.
Such characteristics give an insulator the OPPORTUNITY to become long lived.

"PYREX" is a registered trade-mark and indicates manufacture by

CORNING GLASS WORKS • CORNING, NEW YORK

# PYREX POWER INSULATORS

# MEN OF THE INDUSTRY

## F. G. Boyce Named to Suceed B. E. Morrow in Jackson

Frank G. Boyce has been appointed to succeed the late B. E. Morrow as manager of production, engineering and construction of the Consumers Power Company, Jackson, Mich. Mr. Boyce has

F. G. Boyce

been with Consumers company for nineteen years and moves up from the position of assistant to Mr. Morrow. Previous to his connection with the Michigan utility Mr. Boyce was electrical engineer for the Milwaukee Electric Railway & Light Company, going there from the Goodyear Rubber Company at Akron, Ohio, where he was power plant superintendent. His early experience was obtained in construction work for Stone & Webster.

•

## A. A. Cree Assigned New Executive Duties

Albert A. Cree has been appointed vice-president of the Twin State Gas & Electric Company and the Central Vermont Public Service Corporation, with headquarters at Rutland, Vt. His duties are those of executive officer in charge of operations for the entire Central Vermont company and for the Vermont divisions of the Twin State organization. Previously Mr. Cree was connected with the New England Public Service Company, which controls the two companies named, with offices at Augusta, Me., and prior to 1934 he was affiliated with the investment banking firm of Lee, Higginson & Company, New York, for about fifteen years.

•

▶ O. G. THURLOW, formerly connected with the Alabama Power Company and well known in the electrical industry as inventor of the Thurlow back-water suppressor, has been appointed consulting engineer on a $6,000,000 industrial water project for Birmingham, for which federal loans and grants have been approved.

▶ OTTO DE LORENZI has been appointed assistant general sales manager of Combustion Engineering Company, Inc., New York. Mr. de Lorenzi has been with the company since 1916 in various engineering capacities. He is a graduate of Cornell University and a member of the American Society of Mechanical Engineers.

•

## J. C. Sackman Directs Sales for Indiana Utility

James C. Sackman, who has been assistant to the general sales manager of the Northern Indiana Public Service Company, has been named general sales manager by Dean H. Mitchell, vice-president and general manager of the company. Mr. Sackman succeeds C. V. Sorenson, who resigned, effective December 14, to become general sales manager of the Citizens Gas & Coke Utility at Indianapolis.

Mr. Sackman entered the employ of the Northern Indiana Gas & Electric Company, predecessor of the Northern Indiana Public Service Company, in 1924 following his graduation from Purdue University. He has had wide experience both in the sales and operating branches of the utility business, having served variously at the Indiana By-Product Gas plant as chemist; in the commercial lighting de-

J. C. Sackman

partment; at Plymouth in the sales and operation department; at Hobart as a supervisor when the Hobart Light & Water Company was taken over by the Northern Indiana Public Service Company, and at Gary and Hammond. He was sales supervisor for the Gary Heat, Light & Water Company prior to the separation of management of that utility and the Northern Indiana Public Service Company. During the three years he served in that capacity he also was responsible for sales in the Hammond division, which includes Crown Point and other communities. He became assistant to Mr. Sorenson in December of last year when Mr. Sorenson came to Hammond.

•

## H. A. Brooks Promoted to Vice-Presidency

Harold A. Brooks, commercial manager of the Potomac Electric Power Company, has been promoted to the position of vice-president. As commercial manager Mr. Brooks built up the load of the company until, in 1935, it passed the 1,000-kw. average per consumer.

Mr. Brooks has been with the Potomac Electric Power Company for 25 years. He entered the service of that company in 1910 as an illuminating engineer.

H. A. Brooks
*Harris & Ewing*

Later he was in charge of the commercial engineering department. After returning from military service in France he entered the merchandising branch of the company's activities and since 1920 has been the commercial manager.

•

▶ ADHEMAR LAFRAMBOISE, town engineer of Ville La Salle, has been appointed engineer with the new Province of Quebec Electrical Commission.

▶ OTTO H. FALK, chairman of the board of the Allis-Chalmers Manufacturing Company, has been elected chairman of the executive committee, to succeed the late Fred Vogel. ALFRED J. KIECKHEFER has been elected a member of the executive committee.

▶ COLIN F. CHISHOLM, manager of the Suburban Gas & Electric Company, Revere, Mass., from 1900 to 1934, and since the latter date an advisory executive of that utility, has been made vice-president, with headquarters at Revere. Mr. Chisholm entered the company's service 53 years ago and is one of the best known central-station men in the northeast. He was superintendent in the early days of the Tenney organization's development. ALFRED F. GARDELLA, who has been acting manager of the company

# *Balancing* *Transformer Loads*

# *Measuring Motor* *Loads*

## THE *New* CLIP-ON AMMETER

*by* *Ferranti*

OFFERING

*23 important features*

●Every one of the 23 features, fully explained in the booklet above, can be interpreted as simplifying your work, providing safety for you as well as giving you the accuracy you expect of the highest grade instrument.

Whether you wish the information in the booklet as a means for helping in your own work—or that of a department—it will well repay your immediate investigation.

**0—100 AMPS.**
**0—500 AMPS.**

**$65**

**TWO RANGES IN ONE SELF-CONTAINED INSTRUMENT**

## ----SAVES YOUR TIME and MONEY

You get a safe and rapid means to measure the current flowing in A.C. conductors and in addition you get:

ACCURATE READINGS due to self-aligning core and knife-edge pointer.

•

SAFETY to you and the equipment since jaws, frame and handle are all insulated.

•

WIDE USE since readings can be taken from zero to 5,000 amperes and on cables or brushers up to 2¼" diameter.

•

DUAL RANGE . . . actually two instruments in one.

•

EASY USE; for there are no additional parts to carry around and all operations are made with one hand.

•

These are some of the 23 features that provide safety, ease and speed in determining balance in three-wire systems or three phase circuits and in checking loads on feeders, switches, motors, transformers, etc. Send for the booklet illustrating all the features of the new Clip-On Ammeter.

**FERRANTI ELECTRIC, INC.**
130 West 42nd St., New York

FERRANTI ELECTRIC, Ltd.
Toronto, Canada

FERRANTI, Ltd.
Hollinwood, England

since early 1934, has been named manager. Mr. Gardella entered the service in 1911 as a meter setter, soon became foreman of the meter department and then assistant superintendent. From 1914 to 1928 he was superintendent of plant, and was assistant manager from 1928 to 1934.

•

## Riley Stoker Changes Duties of Officials

James W. Armour, vice-president and chief engineer of the Riley Stoker Corporation, Worcester, Mass., has been appointed manager of the Detroit office, in charge of activities in the Michigan and northern Ohio territory. He has been on the company's staff for about fifteen years. Ollison Craig, consulting engineer of the company at Worcester, has been made manager of the engineering department. He was formerly research engineer of the Underfeed Stoker Company of America, joining the Riley organization when the two companies were merged.

Arthur W. Hunter, formerly assistant sales manager of the boiler division of the Riley company, has been named sales manager of the corporation, with offices at Worcester. He was a manufacturers' sales representative in the power plant equipment field at St. Louis, Mo., prior to joining the Riley forces.

•

▶ CURTIS R. WELBORN, superintendent of the label service department of Underwriters' Laboratories, has been elected secretary of the Laboratories to succeed David B. Anderson, who has retired after serving as secretary for the past nineteen years.

▶ C. V. SORENSON, for many years connected with the merchandise department of various Indiana electric utilities, has been named general sales manager of the Citizens Gas & Coke Utility, Indianapolis. Mr. Sorenson since November, 1934, had been general sales manager of the Northern Indiana Public Service Company, with headquarters at Hammond, and prior to that time was in charge of merchandise sales for the Public Service Company of Indiana and the Northern Indiana Power Company.

▶ CLINTON W. HOUGH, a vice-president and director of the North American Company, has resigned, according to a list of officers and directors forwarded to the committee on stock list of the New York Stock Exchange. He had been connected with the organization since 1921 and had been vice-president for the past two years. Mr. Hough also resigned as a director of the North American Edison Company. Charles A. Stone has also resigned as a director of the North American Company and Richard McCulloch and J. D. Mortimer have succeeded him and Mr. Hough. Mr. Mortimer is no longer president, but is still a director of North American Edison Company, of which J. F. Fogarty is now president instead of chairman.

▶ HOWARD F. CARLSON, formerly of the power sales department of the Cambridge Electric Light Company, has joined the sales staff of the Clark & Mills Electric Company, Cambridge and Boston, Mass., contractor-dealers.

▶ CHARLES A. MCLENNAN of River John, Nova Scotia, left recently for Bombay, India, as a representative of the American & Foreign Power Company. For the past seven years he had been load forecaster at the Millbury, Mass., power station of the New England Power Company. Mr. McLennan will spend three years at Bombay, developing commercial sales of power.

▶ CHARLES L. DUNN of the meter department, Northampton Electric Light Company, a subsidiary of the Massachusetts Utilities Associates, has been made Mayor of Northampton, succeeding James Boland. He shares the distinction of having been elected chief executive of a New England city while a public utility man with Robert Brown, sales manager of the Concord (N. H.) Electric Company, who for several terms was Mayor of the Granite State capital.

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# OBITUARY

## Frank D. Pembleton

Frank D. Pembleton, sales manager, electric, Public Service Electric & Gas Company, Newark, N. J., died December 27, of a heart attack, at his home in Arlington. Mr. Pembleton had been in the employ of Public Service and predecessor companies since 1901. He held several positions in the new-business department of Public Service Electric & Gas Company and in 1927 he was promoted to assistant to the vice-president in charge of sales. In 1931 he was promoted to assistant general sales manager, electric, and a year ago to sales manager, electric.

•

▶ SIR RICHARD TETLEY GRAZEBROOK, F.R.S., who died recently at the age of 81, was the first director of the British National Physical Laboratory. In that position he did invaluable work in the field of electrical standards. It was in 1899 that Sir Grazebrook was named director of the laboratory. On him fell the task of organizing a staff and putting the institution into working order, and when he retired in 1919, after nearly 20 years of service, he could point to an enormous expansion in the range of its operations and its usefulness to the electrical and other industries. Despite the demands of administrative duties, he found time for the construction and evaluation of electrical standards. For many years he was secretary to the Electrical Standards Committee of the British Association and in 1904 he attended the Electrical Congress at St. Louis as a representative of the British Government and of the Institution of Electrical Engineers. He served as president of the latter body in 1906-07. Sir Richard was the author of a number of textbooks on heat, light, mechanics and electricity.

▶ CHARLES A. TEN EYCK, assistant treasurer of the Arrow-Hart & Hegeman Electric Company, Hartford, Conn., died December 27 at his home in West Hartford. Mr. Ten Eyck was 65 years old.

▶ ALEXANDER W. HARTMAN, 71, prominently identified with the Minnesota utility field for a half century, died in Duluth January 6, following a heart attack. He was vice-president of the Minnesota Power & Light Company. Mr. Hartman was born in Shakopee, Minn.

▶ J. C. MORELLO, president of the California Electric Company, Oakland, died in that city, November 23, from pneumonia, following an operation. He was 47 years of age and began his electrical career in the contracting business in Butte, Mont. For many years he had been active in the affairs of the Electrical Contractors' Association and Motor Dealers' Association in northern California.

▶ IRA ELLSWORTH GUTHRIE, 54 years old, who died recently in Chicago, was widely known in Indianapolis, where he was secretary and treasurer of the Interstate Public Service Company, now the Public Service Company of Indiana. He left Indianapolis for Florida in 1925 and later went to Chicago, where he was assistant treasurer of the Utilities Power & Light Company of Chicago.

▶ ARTHUR S. EDGAR, one of the leading executives in the electrical industry of Canada, died December 14, in Toronto General Hospital, following a brief illness. Mr. Edgar, who was 48 years of age, had been identified with the Canadian General Electric Company for 32 years and had been manager of the general merchandising department for the last fifteen years. Mr. Edgar was president of the Radio Manufacturers Association of Canada and served on the executive board of the Canadian Engineering Standards Association.

# BURROUGHS PUBLIC UTILITY BILLING MACHINE provides these NEW FEATURES that cut billing time and billing costs

### MORE REGISTERS

This new feature permits automatic accumulation of figures by revenue classifications, rate blocks, etc., as a by-product of the billing operation.

### LINE PROOF

This new feature detects errors in writing the meter readings and consumption. Meter readers' errors in subtraction, and operators' errors in writing the consumption figures, are detected before the incorrect figure is printed or added. This saves much time in making corrections and in proving bills.

### AUTOMATIC COUNT OF BILLS

The machine automatically counts the number of bills added in each register, for proof and statistical purposes.

### INCREASED SPEED OF CARRIAGE

Faster carriage operation speeds up the entire billing job.

### AUTOMATIC EJECTION AND STACKING OF COMPLETED BILLS

After the bill is written it is automatically ejected and stacked. Thus when the billing work is completed, the bills are in exactly the same order as when they were received by the operator.

Whatever your billing plan—Stub, Bill and Ledger, or Register Sheet—new features and developments on this new Burroughs bring greater speed, simplicity and ease to the entire job. It provides such *new* features as more registers . . . line proof . . . and increased speed of carriage. So many of its operations are automatic that the machine actually does most of the work. The famous Burroughs short-cut keyboard further increases the machine's speed and ease of operation.

It will pay you to investigate these new features, and determine for yourself to what extent they can speed up and cut the cost of your own customer billing. For full particulars, including a demonstration, telephone the local Burroughs office, or write direct.

**Burroughs**

BURROUGHS ADDING MACHINE COMPANY
6931 Second Boulevard, Detroit, Michigan
I would like complete information about Burroughs Public Utility Billing Machine.

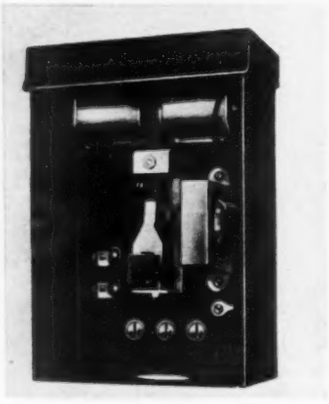
Name_____

Address_____

# NEW EQUIPMENT AVAILABLE

## Street Light Control

Simple, efficient, low-cost control of multiple street lights and off-peak services is claimed for this new polarized control system. A direct-current impulse, sent out over either the distribution primary neutral or pilot wire from the station battery, actuates the controller armature to open or close the street light circuit, depending upon the direction of the d.c. impulse. One small panel at the power station will handle any number of controllers. Control wires carry only 120 volts for a few seconds each day and are dead at other times.



"Polatrol;" operates on 75 milliamperes from 120-volt station battery; control unit mounts on either steel or wood pole in 8x4x5-in. case. **United Electric Controls Corp.**, Hoboken, N. J.

•

## Heavy-Duty Receptacles

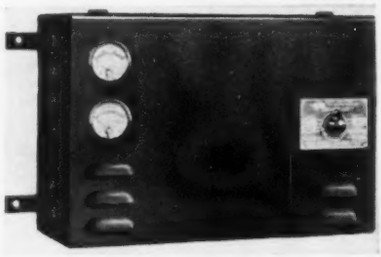
Used where conventional plugs and receptacles are not well suited, this extra heavy-duty "Jumbo Type" unit has many applications. Construction is robust and simple; the various elements are held in position by screwing together heavy metal outer sections. Receptacles are tapped for 2-in. conduit and for smaller sizes a reducing bushing is used.

Operates on 600 volts, capacity 100 amp.; available in two-, three- and four-pole combinations. **Delta-Star Electric Co.**, Chicago, Ill.

•

## Controlled Rectifier

Constant direct-current voltage is supplied under varying load conditions for laboratory and communication use by this controlled rectifier. Voltage regulation is between plus or minus 2 per cent from approximately one-tenth to full load. Output ripple is said to be comparable to that of a d.c. generator of equivalent rating. Efficiency is said to be better than 50 per cent and the power factor better than 65 per cent. Device consists of "Hysterset" (device for holding d.c. voltage within limits), rectifier and filter units.

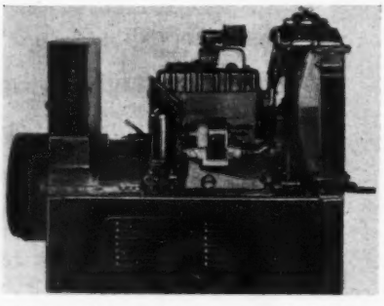


Available in sizes from 30 to 250 watts for operation on 110-volt, single-phase supply; metal case arranged for wall mounting; larger units supplied with d.c. voltmeter and ammeter. **Ward Leonard Electric Co.**, Mount Vernon, N. Y.

•

## Gasoline Power Unit

Used as an emergency power source or to supply energy to the isolated user. These gasoline-powered electric plants consist of a four-cylinder tractor engine, generator and control panel with the necessary instruments. The unit is mounted on a heavy angle iron base. No special foundations required. Couplings between the engine and generator are the flexible rubber cushion type.

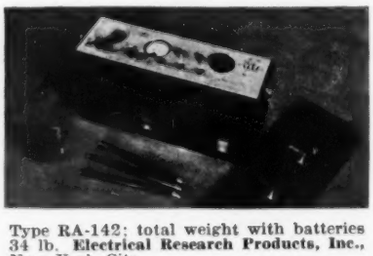


Engine (International Harvester Company), model F-12, 4-cylinder, 3-in. bore, 4-in. stroke, 16.5 hp. at 1,200 r.p.m.; generator 5,000 watts continuous rating, either a.c. or d.c. **Ready Power Co.**, Detroit, Mich.

•

## Sound-Level Meter

Readings as low as 20 db. above the A.S.A. reference level can be made with this highly sensitive sound-level meter intended for use in connection with noise abatement surveys. Features of the meter include calibrating oscillator and receiver, permitting over-all field calibration of microphone and amplifier. Meter uses standard studio-type moving-coil microphone and Western Electric 618-A transmitter. Provision is made for either flat or ear response characteristics by operating a key.

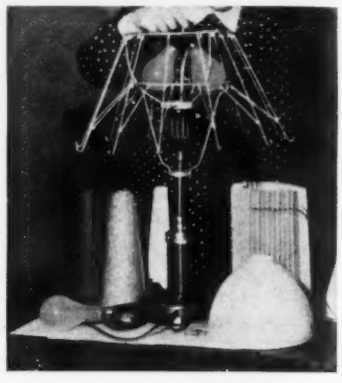


Type RA-142; total weight with batteries 34 lb. **Electrical Research Products, Inc.**, New York City.

•

## Demonstration Lamp

Used in conjunction with a light meter, this demonstration lamp is designed to educate lighting sales people in utility and department stores to demonstrate the seeing advantages of portable lamps. It also provides home service demonstrators with a flexible unit that is many lamps in one and and that demonstrates principles and specifications incorporated in the design of approved lamps.

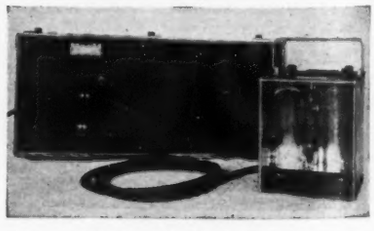


Includes bronze lamp standard, collapsible shade frame, four different collapsible shades, a 40, two 60 and one 100-watt lamp, photo-flood lamp, twin socket and opal glass bowl, also instructions. **General Electric Co.**, Nela Park, Cleveland, Ohio.

•

## Stroboscopic Analyzer

Vibration analysis of high-speed rotating and reciprocating apparatus is facilitated with this high-intensity stroboscope, which makes objects having recurrent periodic motions appear at rest or makes them trace their cycle backward or forward at any desired speed. Instrument consists of a power and a lamp unit. Lamp unit may be moved about when in use. Power unit contains power supply and operates on 115 volts, 50 to 60 cycles, a.c. An inbuilt electronic timer, mechanical contactor or suitable external high voltage may be used to trigger off the lamp.



Type PSE-2, "Stroboglow;" maximum flashing speed 5,000 per minute; weight 55 lb., requires 100 watts. **Westinghouse Electric & Mfg. Co.**, E. Pittsburgh, Pa.

•

## Electrical Reset Relay

Mechanical-latch, electrical-reset relays in both three- and four-pole sizes, single and double throw are now available for thermostatic control of ranges and other electrical

# INSULATING TUBING...

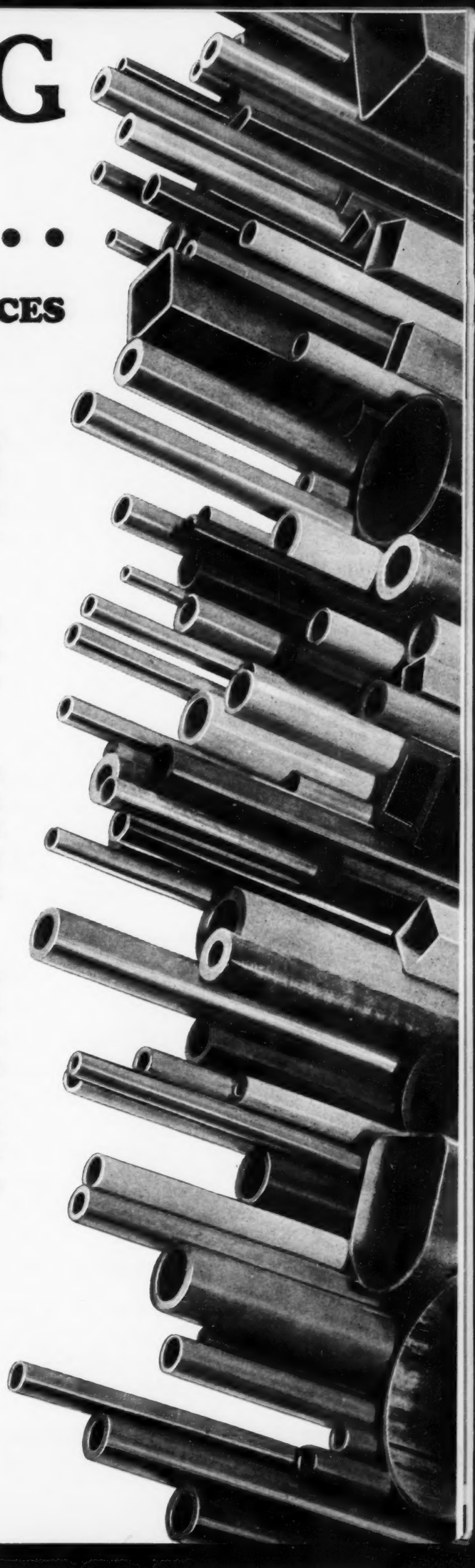
## STANDARD LENGTHS—CUT PIECES —FABRICATED FORMS

Insulating Tubing has been a special study of the Continental-Diamond Fibre Company. If you have an insulating problem involving the use of tubing we believe we can help you regardless of the type you are now using.

Our facilities for manufacturing tubing of various sizes is most complete. We also have unexcelled facilities for fabricating tubing to your specifications.

Since we manufacture practically every type of laminated insulating tubing—including Mica—our recommendations will be unbiased and you will benefit from our knowledge of thousands of applications of insulating tubing in all industries.

We shall be glad of an opportunity to study your particular problems involving the use of insulating tubing and submit marked samples and quotations whether your requirements be DIAMOND *VULCANIZED* FIBRE: DILECTO—a laminated phenolic tubing; MICABOND—bonded Mica; CELLULAK —a shellac kraft tubing; or VULCOID—a thermoplastic, moisture resisting tubing.

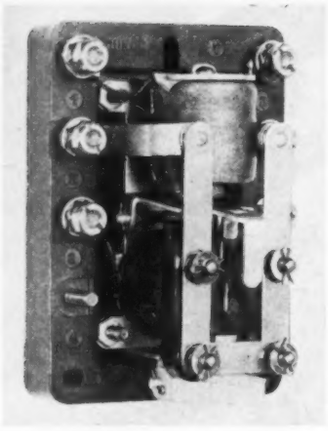


**CONTINENTAL-DIAMOND FIBRE COMPANY**

**NEWARK, DELAWARE**

*District Sales Offices:*

**Chicago. Cleveland. New York. Los Angeles. San Francisco Spartanburg, S. C., Bridgeport, Pa. In Canada, Diamond State Fibre Company of Canada, Ltd., 356 Eastern Avenue, Toronto, Canada.**



**Struthers Dunn, Inc.**, Philadelphia, Pa.

heating equipment and for operating automatic signal lights, etc. These relays are provided with two coils, one for opening and one for closing. Energizing the closing coil picks up the armature when it is latched mechanically until the release coil trips the latch and allows it to drop out.

•

## Flasher Lamp

"Winx." **Tung-Sol Lamp Works**, Newark, N. J.

These flasher lamps for display signs, traffic lights and other animated devices have the operating device built into a small collar in the base of the lamp. The operating principle of the lamp differs from the bimetallic thermostat principle usually employed. Rates of operation ranging from 50 to 200 flashes per second are set during manufacture.

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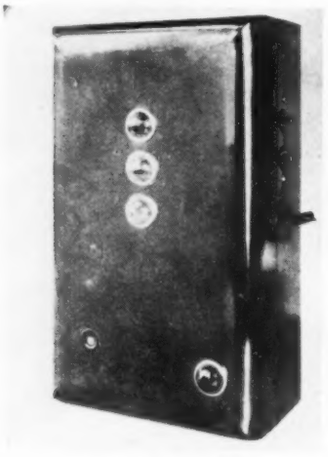
## Circuit Alternator

Where it is desired to operate intermittently electrical circuits such as two pumps motors, magnetic valves, boiler feed pumps or other units, in order to insure equal wear on both operating and standby units, this device finds application. It is also used to



"Alternatector;" Type AD (shown) 19x 15x6.5 in. **Enterprise Foundry Corp.**, San Francisco, Cal.

operate automatically stand-by units in event of failure of whichever one is in service. Individual green lights on cover indicate circuit in operation. Red light and buzzer warn when both circuits are closed, second red light and gong indicate undervoltage or overload.

## Solderless Connector

Size No. 00 for connecting two No. 16 or three No. 18 wires. Size No. 0 for connecting two No. 14 and two No. 18 or four No. 16 or five No. 18 twisted wires. **Rattan Manufacturing Co.**, New Haven, Conn.

Two smaller sizes have been added to the "Marr" line of solderless connectors. This type connector is used in lighting fixture work and in connecting leads of motors and other electrical equipment and avoids the necessity of soldering and taping. In addition to the above the Model No. 7 connector of this line is now available with porcelain instead of bakelite and is used in localities subject to high temperature.

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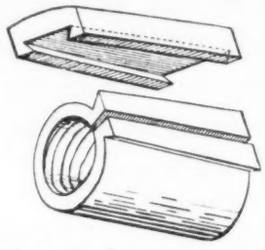
## Connector Coupling

Copper tube conductors are said to be rigidly and easily connected with these "split-sleeve" type connectors. By slipping the coupling over the ends of the pipe or



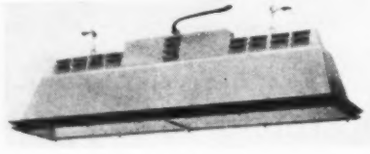
"Dur-Grip" connector coupling. **R. J. Durkee & Associates**, Cleveland, Ohio.

conduit and driving the saddle grip into place raised helical ridges are forced into the conductor, giving a good electrical connection.

•

## Daylight Lighting Unit

Illumination approaching daylight and particularly suited for displaying objects and materials in their true color is attainable with this new trough-type luminaire. The unit is equipped with two 400-watt, high-intensity mercury lamps, current-limiting transformers and three 500-watt inside



**Westinghouse Electric & Manufacturing Co.**, East Pittsburgh, Pa.

frosted "Mazda" lamps spaced alternately with the mercury lamps. Lamps are mounted vertically and the transformers are located in the ventilated upper portion of the luminaire. The trough uses flashed opal glass to diffuse the light. The reflecting surface is white baked enamel with a 77 per cent reflection factor.

•

## Elevator Control Cable

Furnished in any length and with any number of cables up to 37. **General Electric Co.**, Schenectady, N. Y.

This fireproof, multi-conductor, elevator cable is resistant to moisture, oil and corrosive vapors and is constructed to give maximum flexibility and wear. Dielectric strength of the individual conductors is said to be above 25,000 volts at breakdown. Flame-resisting, waterproof rubber insulates the wire itself and is covered in turn with felted asbestos, fire-resisting fillers, rubberized tape and purified, reinforced asbestos-yarn braid.

# ENGINEERING DATA FROM MANUFACTURERS

**Bulletins and catalogs now available to engineers by manufacturers and associations**

Relation of paint to proper lighting is outlined in a 32-page booklet entitled Glorified Light, now available from the Pittsburgh Plate Glass Company, Pittsburgh, Pa. Included in the publication are data on the reflection properties of different paint colors and a series of case studies illustrating the improvement in lighting efficiency obtained with use of proper reflecting surfaces.

Line drawings and oscillograms are used to illustrate the operation and characteristics of line arc contactors in a two-page folder (No. 1145) of the Electric Controller & Manufacturing Company, Cleveland, Ohio.

Phantom views, assembly drawings and characteristic curves are employed in Bulletin No. 600 (10 pages) to describe the construction design and operation of "All Speed" motors of the Falk Corporation, Milwaukee, Wis. Dimension and rating tables are also included.

Engine-type generators are the subject of Bulletin 1153A, available from the Allis Chalmers Manufacturing Company, Milwaukee. In 23-pages of illustrated discussion the mechanical construction and the electrical characteristics of these units are covered. Ratings, voltages, frequencies, thermal characteristics and parallel operation are among the items discussed.

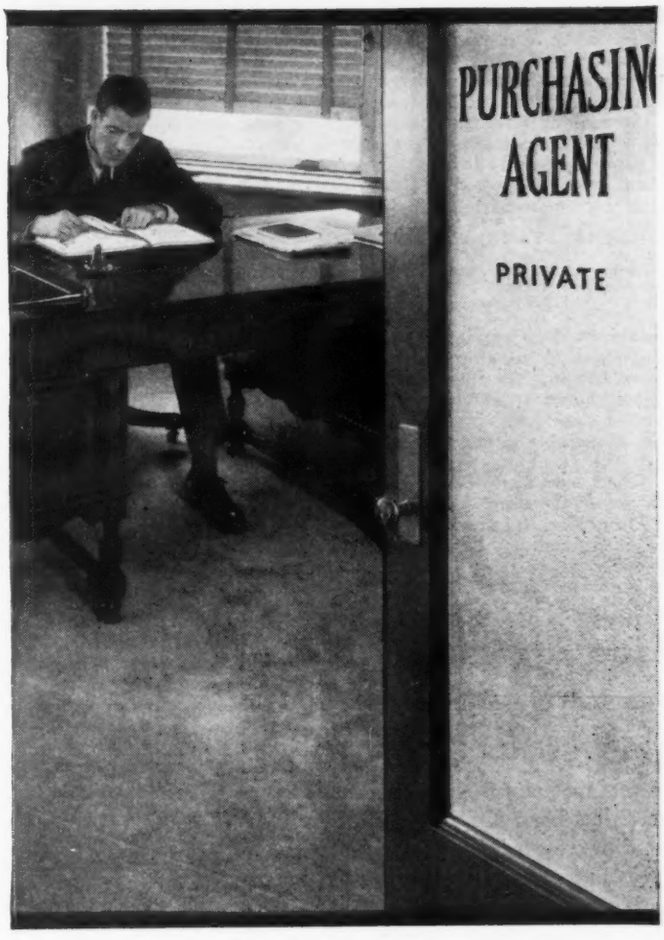
Construction and design features of G&W oil switches are discussed and illustrated in bulletin 354 of the G&W Electric Specialty Company, 7780 Dante Avenue, Chicago, Ill. A companion booklet, designated as bulletin "FC," devotes 16 pages to the engineering characteristics of this make of oil fuse cutouts. Time current characteristic curves and oscillograms illustrate operation of the device.

Horsepower, speed reduction ratios and slow speed r.p.m. of Diehl gear motors are tabulated in a 4-page leaflet (No. 1870) available from the Diehl Manufacturing Company, Elizabethport, N. J.

Smoot regulators, series 50, hydraulic, and series 60, pneumatic, are the subject of Data Book No. 5-11, published by Republic Flow Meters Company, Chicago, Ill. This book contains a brief and well-diagrammed discussion of the fundamental characteristics of a good regulator and describes various methods for the mechanical control of pressure, flow, level and speed.

Technical details of the mechanism of the new Type HG maximum demand register are given and illustrated in bulletin No. 88 of the Sangamo Electric Company, Springfield, Ill.

A revised and enlarged edition of "Procedure Handbook of Arc Welding Design and Practice" is announced by the Lincoln Electric Company, Cleveland, Ohio. The present volume of 586 pages is written in a simple, concise manner. Practically every use and application of arc welding is covered, including American Welding Society specifications for filler metal, method of determining current carried by the electrode, procedures, speeds and costs for all types of welds in sheet metal, A.S.M.E. Boiler Code requirements for butt welds in heavy plate, hard facing of ferrous metals, examples of redesigning for arc welding, use of arc welding in making and repairing cutting tools and dies, speed of welding oil and gas pipe lines, etc.




# *Profits...*

## depend on knowing *how to buy* as well as *how to sell*

•

THAT'S why in every sizable company, you'll find a "Purchasing Agent"—a company buying expert, who finds, from sales interviews and studies, just where and how to buy everything his company needs and how much to pay for it.

The Purchasing Agent is always ready to be shown how your product can help stretch his company's dollar. More than that, he welcomes and expects your help in telling that story to his management executives. It's unfair to expect him to spend his time explaining an unadvertised, unknown product to them. It's part of your job to educate these executives through consistent business paper advertising, so that their good-will plus the P.A.'s reasons-to-buy will make the O.K. a routine matter.

Your modern Purchasing Agent wants you to do this job through advertising, because it sells his management executives, yet allows him to protect them from time-consuming "cold turkey" calls and "missionary work." You'll want to do it *through advertising in the McGraw-Hill Publications,* because it costs ever so much less that way.

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Food Industries
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Power
Product Engineering
Radio Retailing
Textile World
Transit Journal

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## Tests Check New Manhole Cover Designs

[*Continued from page 31*]

axis parallel to the long axis of the sample. As in the static load tests, the covers were mounted in a frame similar to that used in street installations during these tests. The deflection remaining after each impact was measured. These deflections as measured for the three cast-steel designs after the weight had been dropped onto them from a height of 1 ft. were as follows:

| Flat Plate Cast Steel 1½ In. Thick at Center | Flat Plate Cast Steel 1¼ In. Thick at Center | Ribbed Cast Steel |
|---|---|---|
| 0.667 inch | 1.326 inches | 1.342 inches |

The maximum drop applied to the heavy plate design was 24 in., after which the deflection was 1.75 in. An 18-in. drop on the lighter plate caused a deflection of 3.25 in. In neither of these cases was any fracture or crack discernible after the maximum impact.

The ribbed cast-steel cover developed cracks in two of the transverse ribs and deflected 2.75 in. when the weight was dropped onto it from a height of 17 in.

The nickel cast-iron cover broke when the weight was dropped onto it from a height of 2½ in.

## Resistance Welds Widely Used

[*Continued from page 35*]

with either mechanical or magnetic regulators, has been difficult to attain. With the development of electronic tubes previous difficulties have been most satisfactorily overcome, so that with the modern seam welder the proper joining of steel, stainless steel, monel or aluminum plates is accomplished as readily, and in much the same manner, as the stitching together of two pieces of cloth with a sewing machine.

The range of material that may be successfully handled by the seam welder is indicated by the welding of stainless steel as thin as 0.005 in. and of duralumin up to 0.1 in. thick. The average speed of seam welding is about 7 ft. per minute, although, under favorable conditions, speeds as high as 100 in. per minute have been attained. From twelve to fourteen spots per inch have been found to produce gas- and air-tight joints of excellent strength.

Illustrative of the class of work performed on seam welders is the construction of pressure-tight seams, intermittent seams and independent spot welds in refrigerator evaporators. Welding of heads to milk cans, parts of automobiles, gasoline tanks, tubs for washing machines, barrels and grease drums indicates other successful applications of the seam welder.

# Recent Rate Changes

Duke Power Company will be served with a copy of a petition filed with the State Utilities Commission by the North Carolina Merchants Association, requesting that the utility company be ordered to give a commercial lighting rate not in excess of that it grants residential consumers. Stanley Winborn, state utilities commissioner, stated that the company will be given opportunity to answer it and that later a hearing will be set in the matter. The petition claims that the company "unfairly, illegally and unjustly gives a few larger commercial consumers a rate which is considerably lower than that given to the large body of commercial consumers.

•

Tonawanda Power Company has filed with New York Public Service Commission a proposed rate adjustment under which commercial electric customers, including merchants, storekeepers and other users in the same category, will receive an immediate reduction of $8,830. The revised schedule will mean a 4.36 per cent reduction in the total electric bills paid by all customers in this classification and with approval of the commission will become effective February 1.

•

New York State Electric & Gas Corporation has filed a revision of residential rates with the Public Service Commission to be made effective in the Otsego division of the company's territory which is estimated to save consumers $41,500 annually. The company has also filed a revision of electric rates in its Granville district which is estimated to save consumers in that area about $2,160 a year.

•

Derby Gas & Electric Company's proposed adjustment of rates was discussed with the Connecticut Public Utilities Commission at a recent hearing. It is planned to fix rates by discussion, an informal procedure, instead of going to the expense of a formal opinion. A group of petitioners are seeking lower rates. It is agreed by the company and the commission that the gas business is not being run at a profit and any reduction would be unreasonable. The commission finds, however, a reduction in electric rates is justified.

•

Northern States Power Company has announced a new schedule of rates for commercial lighting to become effective January 26, in Pipestone, Minn. Under the new schedule consumers will save approximately 20 per cent on bills. New rates for residential lighting were put into effect recently.

•

Ohio Public Utilities Commission has announced through its chairman E. J. Hopple that public utility customers in Ohio saved more than $3,000,000 in 1935 as a result of rate reductions. Of this total $508,518 was made during the last three months. Mr. Hopple pointed out that reductions were frequently negotiated by the commission without formal hearings, or were made voluntarily by the companies.

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Texas Electric Service Company has issued an order reducing its rates on all classes of electric service in Wichita Falls, following negotiations with Mayor John T. Young and City Council. These reductions average about 10 per cent and became effective January 1. This agreement brings to an end a prolonged controversy between the company and the city which recently took the form of a proposal for the construction of a municipal electric light and power plant. The proposal to issue $1,260,000 of revenue bonds for the project was defeated at an election held December 11 (ELECTRICAL WORLD, January 4, page 124). An effort was then made by the City Council to call another election to vote on the same proposal on February 8. The rate agreement followed.

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# With the Municipals

PARAGOULD, ARK.—If the decision of the Arkansas Supreme Court that the city can build a municipal plant in competition with the existing private utility without obtaining a certificate of convenience and necessity from the State Utilities Commission becomes final it will cost utility rate payers in Arkansas more than $1,000,000 a year, according to a brief filed with the clerk of the Supreme Court recently. The suit in question was brought by E. M. Kitchens, a taxpayer. He sought to prevent the city from proceeding with plans to build an electric light plant and distributing system without obtaining a certificate of convenience and necessity from the state commission. Chancellor J. F. Guatney sustained the city's demurrer and Mr. Kitchens appealed to the Supreme Court, where the chancellor's ruling was affirmed. The petition for rehearing maintained that the purpose of state regulation is to prevent unnecessary competition and to require utilities to hold their rates at a figure that will give all investors a fair return. The Arkansas Utilities Company serves Paragould.

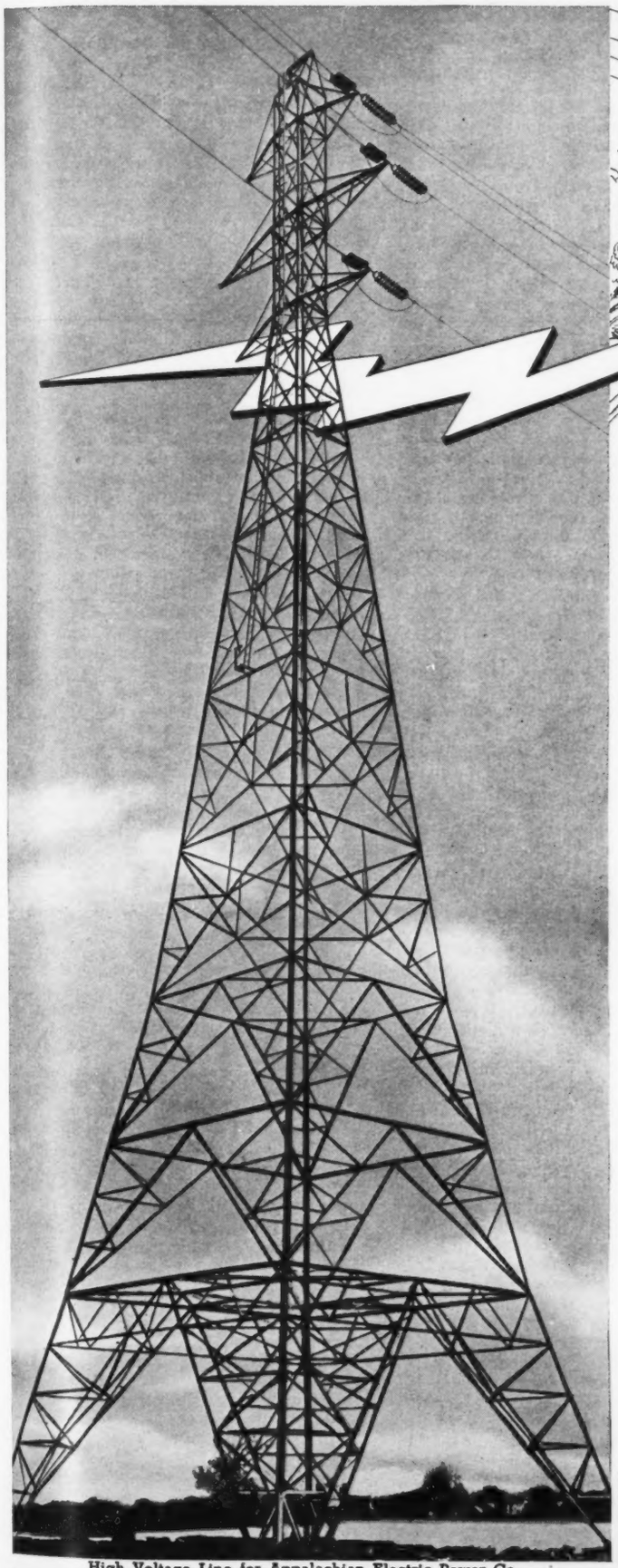
BRUNSWICK, GA.—Plans for the construction of a $63,000 municipal power plant have been withdrawn, following agreement of the Georgia Power Company and city authorities for the power company to furnish power and light at a satisfactory rate. The city had planned its own plant and distributive system, financed partially by a government loan.

DECATUR, GA.—City's suit against the Georgia Power Company for $13,444 plus interest has again reached the United States Supreme Court on a plea by the utility company that the Georgia State Supreme Court disobeyed the highest court in the land in a decision ordering payment by the Georgia Power Company of paving costs. Attorneys for the Georgia Power Company claim that the United States Supreme Court demanded a reinterpretation of the Georgia law, and that the Georgia State Supreme Court, instead of doing this, merely upheld the assessment against the power company again.

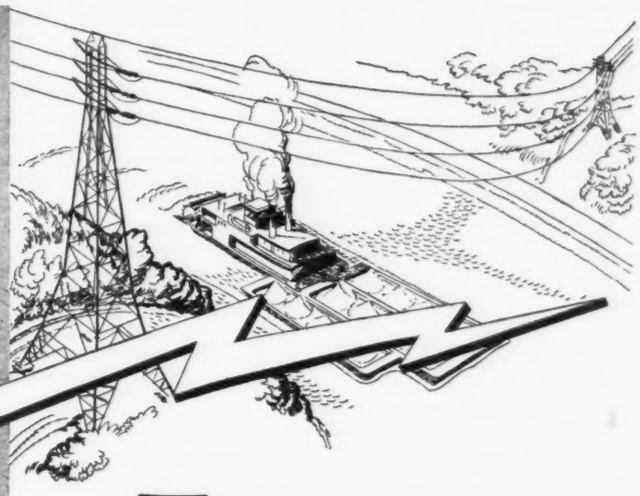
SHREWSBURY, MASS.—Municipal Electric Light Department commercial customers will receive a rate reduction beginning February 1. For the first 50 kw.-hr. the rate will be 5 cents, the next 150 kw.-hr. at the rate of 4 cents, and 2½ cents for all over 500 kw.-hr. The rate amounts to a reduction of 1 cent for the first 50 and 2 cents per kilowatt-hour above that.

AUSTIN, MINN.—A reduction in electric rates totaling $11,400 has been announced. Since the beginning of its fiscal year in February, 1935, the city light board has made a series of reductions that save consumers a total of $35,000 annually.

POPLAR BLUFF, MO.—Announcement has been made by the Board of Public Works that the more than 2,000 patrons of the municipal light plant will share in the profits of the plant. An unusual system of reducing rates for 1936 was decided upon by the board after net earnings for 1935 increased to $30,000. The board decided to draw names each month, selecting approximately one-twelfth of the number of the patrons on the books, and announcing



High Voltage Line for Appalachian Electric Power Co.



# *Towers carry*

# 1917 FOOT SPAN OF 132,000 VOLT LINE

## *over Ohio River*

THESE two river-crossing towers typify the most advanced design for economy and strength on transmission lines. Located at Kenova, W. Va., each is 240 feet in height . . . with a maximum leg-spread of 70 feet at ground level . . . carrying the river span of 1917 feet . . . with spans on either side of 1460 and 1552 feet tying into the 50 mile long line with its 88-foot towers in either direction. They will carry a double circuit installation, though now strung for single, extending from Institute, W. Va. to South Point, Ohio.

An experienced department of American Bridge Company designs, fabricates and erects steel towers of all types to carry power or radio lines, electrical sub-stations and steel structures for all branches of industry. Call on American Bridge Company engineers to aid you in your work.

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# UNITED STATES STEEL

through newspaper advertisements that their monthly bills for the month drawn would be marked "paid."

ROME, N. Y.—Proposed new municipal electric light plant was abandoned at a recent meeting of the Common Council. Alderman A. J. Mariani stated that the plant would be too costly to the taxpayers. They would also be deprived of the large revenue now received from the taxation of the established power plant. Northern New York Utilities, Inc., now serves the city. The new plant would cost $1,000,000. This item was published in error in the January 11 issue of the ELECTRICAL WORLD under the heading, Syracuse, N. Y.

NEW HYDE PARK (Long Island), N. Y.—Appellate Division in Brooklyn reserved decision on the question of invalidating the recent village referendum which authorized the construction of a municipal power and lighting plant. The Long Island Lighting Company held that insufficient notice of the meeting had been given and that, since P.W.A. funds will be used, the procedure authorizing the construction of the plant should follow P.W.A. requirements.

DEVIL'S LAKE, N. D.—District of Columbia Supreme Court order temporarily restraining P.W.A. Administrator Ickes from allocating $254,545, of which $114,545 is an outright gift, has been issued on the petition of the Otter Tail Power Company. The utility company maintained that Devil's Lake was an important link in its generating and distribution system and the proposal to allocate funds to the town to construct its own power system would deprive it of its franchise privileges and investment and would work a hardship on other communities which make up its chain. Justice James M. Proctor issued a rule, returnable January 21, directing Mr. Ickes to show cause why a preliminary injunction should not be issued.

## Utilities in Court and Congress

[*Continued from page 41*]

on electricity. The more the federal government spends in the meantime, *before* Maine spends any of her own money, the better for Maine taxpayers. Some of them say worse things than that, but so far not on the floor of either house, where their remarks might be quoted without too much danger from the libel laws.

New Dealers are indignant because they think Brann is complacent. Several canvasses have shown that Brann is personally very strong in Maine—Roosevelt, who did not even carry the state in 1932, far weaker than then.

Actually, slackening of work on Quoddy is not significant. If Congress approves it, along with the Florida Canal and other projects so far never passed on by the national legislature, Roosevelt will go ahead with Quoddy full steam next spring. The whole thing would then be more beneficial politically than if it had followed an even course. This just happens to be so, the writer is convinced. The particular jobs the men who were let go were working on were finished.

# SALES OPPORTUNITIES IN NEW CONSTRUCTION

SIBLEY, LA.—Louisiana Power & Light Company, New Orleans, La., has authorized extensions in transmission lines from Choudrant to Sibley and vicinity, about 14 miles, and will proceed with work at once.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, Knoxville, receives bids until January 22 for main control switchboards, auxiliary control switchboards, terminal boards, generator exciter, distribution switchboards, hydraulic gage boards, annunciator system, oscillograph and instrument transformers for Wheeler hydroelectric power plant. Also, until January 29 for transmission poles and anchor logs for proposed rural electrification in T.V.A. area.

NEW YORK, N. Y.—Johns-Manville Corporation, 22 East Fortieth Street, plans installation of motors and controls, conveyers and other equipment in connection with expansion and improvements in asbestos and insulating board and roofing plants at Waukegan, Ill., and Manville, N. J., in 1936, and at asbestos mining properties at Asbestos, Que. Cost over $500,000.

BANKS, ARK.—Southwest Telephone & Power Company, West Memphis, Ark., plans new transmission line from Harrel to Banks for rural electrification in that area; distribution system and service facilities will be installed at Banks, as well as other communities. Permission has been secured.

MOORHEAD, MINN.—Asks bids early in February for extensions and improvements in city-owned electric power plant, including coal and ash-handling machinery and other equipment. Ralph D. Thomas, 1200 Second Avenue, South, Minneapolis, Minn., is consulting engineer.

WOODSTOCK, ILL.—Receives bids until February 7 for switchboard for city-owned electric power plant, including quotations both on metal clad and cubical type units. Commercial Testing & Engineering Company, 360 North Michigan Avenue, Chicago, Ill., is engineer.

ATLANTA, GA.—Monarch Wine Company, 101 Wooster Street, New York, N. Y., plans new winery at 643 Glenn Street, Atlanta, where property has been secured. Cost about $100,000.

DENVER, COLO.—Bureau of Reclamation, Denver, receives bids until January 31 for 420,000 lineal feet of 5000, 1000 and 600-volt rubber insulated cable, 14,000 lineal feet of rubber and asbestos insulated cable, 3150 lineal feet special insulated cable, and 6850 lineal feet of 5000-volt varnished-cambric insulated cable for Boulder power plant, Boulder Canyon Project, Arizona-California-Nevada (Specification 759-D).

DEVILS LAKE, N. D.—Plans early construction of new city-owned electric light and power plant, for which fund of $254,500 has been secured through Federal aid. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

UNION, WASH.—Public Utility District No. 1, Mason County, has returned bids recently received and plans early call for new bids for about 16 miles of transmission and distributing lines, including about 3200 lineal feet of submarine power cable, for rural electrification project, with power substation and service facilities. Financing is being arranged through Federal aid. C. M. Pixley, Union, is engineer.

LOGAN, W. VA.—Appalachian Electric Power Company, Roanoke, Va., has plans maturing for proposed expansion in steam-electric generating plant at Logan and will carry out project in 1936. Extensions will also be made in transmission lines. Main turbo-generator unit and accessories will be furnished by General Electric Company. Awards for other equipment will be made in near future. Cost over $2,500,000.

OAKLAND, CALIF.—Moore Dry Dock Company plans installation of heavy duty motors and controls, electric hoists, electric pumps and other equipment in connection with extensions in floating dry dock at shipyard, foot of Adeline Street. Cost about $200,000.

PERRY, N. Y.—Has engaged L. C. Reynolds, Perry, engineer, to make surveys and estimates of cost for proposed city-owned electric light and power plant, including distributing system. Preliminary figure placed at $125,000 for station, using Diesel engine-generator units, and $80,000 for distributing lines.

THOROLD, ONT.—Ontario Paper Company, Ltd., plans early call for bids for turbo-generators and other electrical equipment for new steam-electric generating plant at paper mill, recently referred to in these columns. Award for steam power equipment recently let to Foster-Wheeler Company, Ltd., St. Catherines, Ont., as previously announced. Plant estimated to cost about $1,000,000.

ARMOUR, S. D.—Northwestern Public Service Company, Huron, S. D., soon begins superstructure for new steam-electric power plant on site near Armour, for which preliminary grading and foundation work is being started. Cost about $100,000, with equipment. Walter J. Dixon, Woelfel Building, Mitchell, S. D., is architect.

ATRECO, TEX.—Atlantic Refining Company, 260 South Broad Street, Philadelphia, Pa., plans installation of motors and controls, power substation apparatus, electric pumps and other equipment in new oil refining plant at Atreco, near Beaumont, Tex. Cost in excess of $2,000,000.

MAGNOLIA, MD.—Bureau of Aeronautics, Department of Commerce, Washington, D. C., plans installation of night lighting system, landing lights, beacons, etc., with electrical distribution lines and control equipment at new intermediate airport and landing field at Magnolia, Hartford County. Fund of $500,000 is being allotted for entire project.

SANDUSKY, OHIO—Has engaged Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., consulting engineer, to prepare plans for city-owned electric light and power plant. Surveys and estimates of cost will be made at once.

CINCINNATI, OHIO—Union Gas & Electric Company is considering preliminary plans for extensions and improvements in West End generating station, with installation of additional equipment for increased capacity. Proposed to carry out work in 1936. No estimate of cost announced. Columbia Engineering Corporation, Fourth and Plum Streets, a unit of Columbia Gas & Electric Company, of which Union company is a subsidiary, will be in charge.

EDGE MOOR, DEL.—Ludlow Manufacturing Associates, Ludlow, Mass., plans installation of motors and controls, regulators, conveyors, etc., in new multi-unit jute and cotton webbing mill at Edge Moor, Wilmington, for which super-structures will soon begin. General contract has just been let to Barclay White Company, Philadelphia, Pa. Cost close to $1,500,000.

DEARBORN, MICH.—Ford Motor Company plans early installation of new continuous glass-melting furnace with electric power equipment and complete accessories in sheet-glass mill. Cost about $500,000.